The Model Engineer

A journal of Small Power Engineering.

Edited by Percival Marshall, C.I.Mech.E.

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Our Point of View.

Problems in Model Engineering.

Lest it escape the notice of some to whom the article could well have been dedicated, let us draw readers' attention to page 279 in this issue. As we have, in our footnote to the article, invited correspondence on the expressed convictions of our contributor, we must forego the pleasure it would give us ourselves to reply here to his many keen and pointed dicta. The article is more than ordinarily interesting, for it is not confined to any one phase of the model engineer's work ; the locomotive and railway engineer, the marine modeller, the horologist, and the physicist-each in turn is told in what manner of way he might apply his abilities differently, more profitably, more, shall we say, sanely? And all from the point of view of one who has, so far, not developed any degree of enthusiasm for any one side of our craft! Were it otherwise we should not now have been able to enjoy, in common with the reader, his cold and penetrating logic. What have our readers to say ?

* * *

Speed Boat Competition Rules.

Just previous to the publication of the *M.E.* Speed Boat Competition results for 1922, Mr. Noble, of Bristol, sent us a few lines on the subject of the amendments we propose to make to the rules at present governing this yearly event. He says :-Since the letters of Mr. Westmoreland and myself *re* the rules of the Speed Boat Competition some three months ago in the *M.E.* there has been nothing further published on the subject. Is this because there is no longer sufficient interest in this branch (speed) of model power boating ? Or have the high-speeds attained by recent medal winners discouraged the majority of would-be competitors? While speed pure and simple is the sole object of the competition there will always be a few who, perhaps from a slightly keener interest, or possibly better opportunities both for building and running their boats, will outdistance the remainder, to the ultimate detriment of the Competition from a popular point of view. It would be a pity if the very success of the Competition, remembering its object, viz., improvement in speed, were to prove its failure, for without more support in the matter of increased entries one can hardly expect its founders to continue. What is required, then, is to so frame the rules and conditions of entry that the necessary increased entry is obtained. With this in view may I suggest that while not altogether putting speed aside the question of reliability be considered? A medal to the boat making the longest non-stop run may improve things. It would rest with you whether the word " longest " stands for distance or time. For example: a boat runs 10 laps at 20 m.p.h., or 15 laps at 15 m.p.h., or 20 laps at 10 m.p.h., or 30 laps at 7 m.p.h. Possibly a discussion in your columns will discover the best method of judging the above hypothetical results.

* * *

A Reliability Award.

The proposal to introduce the factor of reliability into a contest that is admittedly one of speed alone has and always will have, divided support. Speaking for ourselves we may say we do not think the interest in pure speed is waning. It is true there are comparatively few really fast boats built and run nowadays, but there are more than there were, and there would be many more still could we find or make more and better sailing waters. The speed-boat man must have his lake fairly near at hand. His

work is essentially experimental, and experiment implies trial—often many trials. What is wanted is an intensive campaign to interest and inform the various local authorities in whose districts there are at least possible facilities for providing the necessary water. Then again, as the competition involves purely experimental work, there is no need at present to introduce anything beyond what may be termed basic restrictions, in our case, weight, and we still think classification on this basis, but with the weight-to-play-with in each class much reduced. is all that is required to provide some keen racing. If once one begins to tax any individual component. or feature of a craft the tendency is to go on taxing, untii in the end the rule either produces a purely one-design class, or a number of more or less ingenious attempts to cheat it ; and the ingenuity expended in the latter direction could generally be used more effectively for a more worthy purpose. With regard to the suggestion to provide an extra award for boats whose reliability factor is deserving of special distinction we may say the matter is now being discussed with an old M.E. reader who was good enough recently to offer a Cup for Reliability. We hope to be able to give particulars of his proposal in an early issue.

* * *

Scale Speeds.

" The Cheery Critic " suggests in this issue a method whereby the performance of vessels of widely (or slightly for that matter) different displacements could be brought to a common comparable basis. His proposal would enable vessels of any weight within a given maximum limit to compete with each other, thus doing away with the need for several classes. The scheme is interesting, and were it at all likely to receive much pratical support from builders of exceptionally small craft it might have a chance of success.

* * *

Misleading Advertisements.

When a potential purchaser reads "Weldless Steel Tubing $\frac{1}{8}$ in. and 3-16ths in. bore so much per foot " in an advertisement we think he is entitled to his opinion that it is being offered and is to be had in reasonable lengths. This, however, is not the view of one firm who have recently been offering this material for sale, for a reader in the provinces who ordered a few feet was supplied in lengths of quite useless dimensions-many just an inch or two long. We do not believe that in this particular case there was any intention of wilfully misleading the purchaser, but we do think the unfortunate customer who finds himself the victim of such circumstances is entitled to the view that an advertisement so worded is not an example of straight and honest business. In the case we have in mind it would have been a very easy matter for the advertiser to have avoided the possibility of giving the buyer a wrong impression. The addition of two words in brackets " [short lengths]" would have made the whole matter clear ; there would have been no dissatisfied customers, and there might have been plenty of repeat orders. As it is the incident has been duly noted by our correspondent, his ship's full company probably have by now heard the story (he is a marine engineer), and we can quite understand that there will be no more postal orders sent to a certain address from that little seaport for a very long time indeed. It is a great pity that advertisers. and particularly those using our " Sales and Wants" columns, do not pay more attention to the drafting of their advertisements. If they would put themselves for one moment in the place of the likely buyer and scan their own wording once again before finally sending it along to us for insertion, we believe they would often discover undesirable features in their composition which could be modified or corrected quite easily and which would result in their announcement having a greatly increased value as their silent salesman.

* * *

The Whereabouts of Two Fine Models.

About twenty-eight years ago two very fine models, one a single driver 2—2—2 tank locomotive, and the other a traction engine with winding gear and a front extension to carry a dynamo, were exhibited in the window of a wine and spirit merchant's shop in Lavender Hill, Battersea, a few doors from the intersection of that thoroughfare with Queen's Road. A correspondent who gives us this information wishes to find out if possible what has become of them. Both models were to a scale of about 1 in. to the foot, and had a good deal of bright steel about them. They disappeared from view some years ago and the then proprietor of the shop referred to knew nothing about them.

* * *

Address Wanted.

Will Mr. B. A. Quinsee, who exhibited a $\frac{3}{4}$ h.p. horizontal stationary petrol engine at the last *M.E.* Exhibition kindly send us his present address, as correspondence directed to his previous address at Malton, Yorks, has been returned to us through the Post Office marked " gone away."

* * *

The Owner of "Zu-Zu."

We wish to point out that the owner of the steamer *Zu-Zu*, referred to on page 237, March 8 issue last, is Mr. A. E. Wareham and not Mr. Walters, as erroneously stated. We tender our apologies to Mr. Wareham for our mistake.

E. H. (no address).-The questions you raise *re* internal combustion engine running will be fully dealt with in our columns shortly.

Model Marine Notes.

"Tortoise I."

By "JOHN DOE."

POWER-BOATING as a hobby is unique in affording opportunities for the exercise of such varied accomplishments ; if one designs and builds one's own boats it is necessary to acquire skill at the drawing board, considerable dexterity as a noodnorkcr, great pains and patience for numerous metal-working operations, and when the boat is built, much time and thought must be expended in "tuning-up." Prowess as a sprinter is an advantage.

Not fully realising this, the author commenced to build the craft described below ; the idea being "something small and simple" as a start. But, as has been said more than once, the difficulties inherent in the construction of a small simple boat are very considerable. They are!

The design *was* simple when commenced, but underwent a long process of "improvement" before being finally elaborated into that shown in the photographs.

Model makers doubtless know the process of improvement, it runs something like this : "Um! there's not much power in that engine ; now if I give it another 1-16th in. on the bore and another $\frac{1}{8}$ in. on the stroke. . . ."

Reflection shows the boiler to be too small for the "improved" engine, so the boiler is "improved" also, likewise the lamp; in extreme cases it may be necessary to enlarge the hull before the improved plant can be persuaded to fit into it.

I stopped before a fresh hull was required however, but the lengths to which the improving process had run may be judged from the fact that the original design was a D.A. engine, water tube boiler and spirit lamp.

The Hull.

The hull is 2 ft. long, 5 ins. beam and $2\frac{1}{2}$ ins. deep at the stem, the design closely following one of Mr. Brierley's published in the *M.E.* of November 21, 1912, design No. 3.

The method of building the hull is rather novel, only five pieces being used. Reference to the photograph, Fig. 5, which shows the hull, will render the method of building clear. A block was carved to form the shovel-shaped piece at the bow, and rebated along the edge to take the sides, while the bottom was left the same thickness as the depth of the step.

The sides, of $\frac{1}{8}$-in. poplar, were then screwed to this piece, the joint coming just above the "chine line." Next the floor of boat was fixed to the inside of the "shovel," thus giving the "step." Finally, a piece of wood was carved to form the transome, rebated for the sides and floor, and then screwed in position.

All joints were given a coat of copal varnish when building, and are perfectly tight. A piece of thin brass plate bent over the joint of the sides at the bow completed the hull. Weight with deck, 1 lb. 2 ozs.

In a small boat adjustments to the plant cannot be carried out-there isn't room-so to meet this difficulty the plant is mounted on

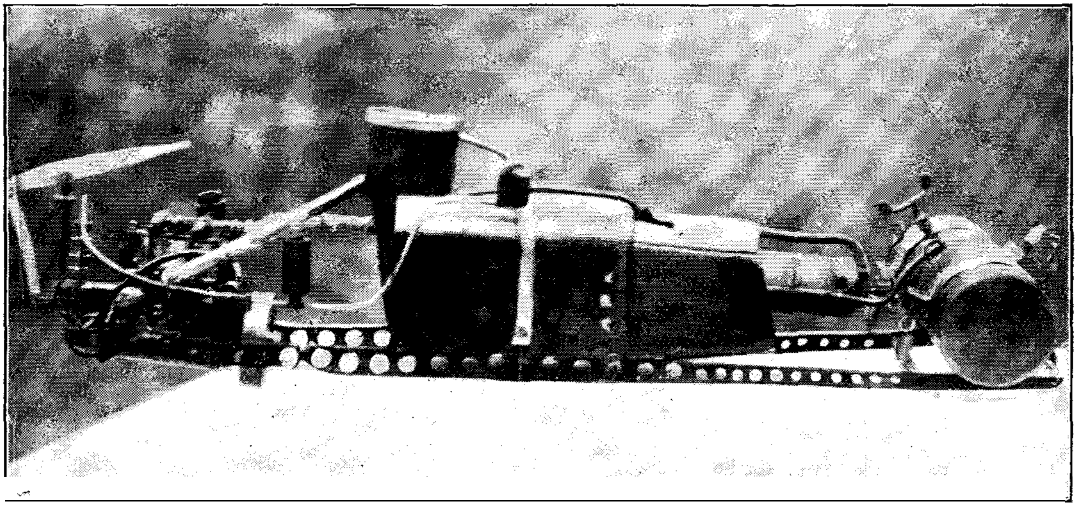


Fig. B.-The Power Plant as now Fitted.

hearers made from 24-gauge iron, flanged, and perforated in the interests of weight saving.

The photograph, Fig. 3, shows the plant cn hearers as originally fitted, Fig. 4 as modified and now in usc.

Plant is held in the hull by metal clips, one at the stern, one just behind the engine flywheel, where notches can be seen in the bearers. These notches prevent the plant sliding back, forward motion is prevented by a wooden block under the engine crankcase, to which the bearers are held by spring passing over the crossbar in front of engine.

Although this may seem rather lacking in rigiditv, it has proved perfectly satisfactory in use. The only connection between the hull and plant is the propeller driver and a short piece of rubber tube from the filter to the pump suction ; should the boat strike anything when running, the whole plant is free to slide forward in its clips, being checked by the spring at the front of engine previously mentioned, so that no damage is done to the plant and little strain imposed on the hull, as the force of impact is obviously less with a "loose" plant.

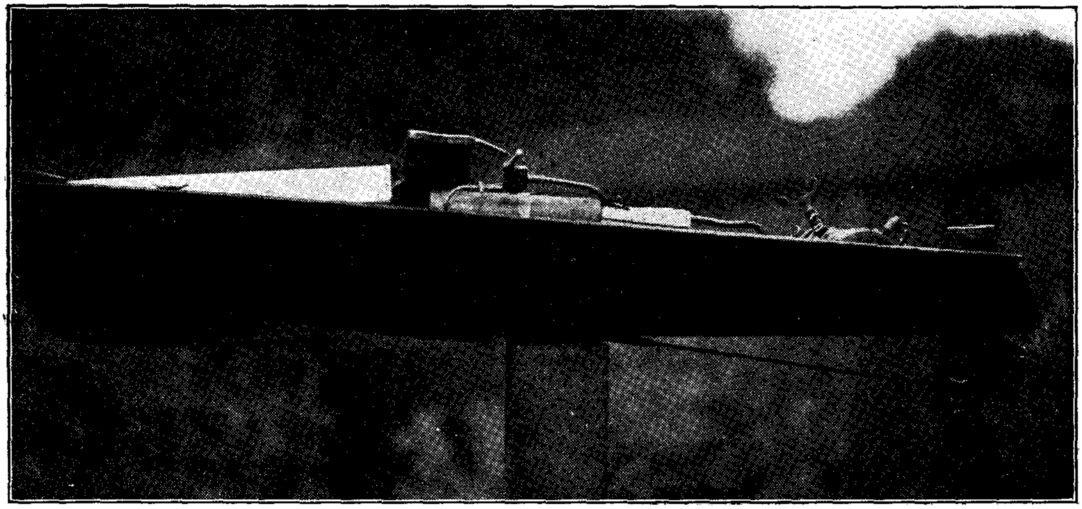


Fig. 1.—The "Tortoise I."

The Plant.

This is of the almost inevitable " flash " type -twin S.A. engine, steel tub0 boiler and blow-lamp, which, by the way, burns paraffin. Let us start at the bow and work " aft "—so that we come first to :—

The Engine.

This is a " free lance " design, particulars of which may be had from the photographs, Figs. 6 and 7, and the section drawing, Fig. 8.

Notice that the pump barrel in the two photographs of engine is shorter than the one shown in the photographs of plant, Fig. 4. The change to the longer barrel was necessary to prevent the valve box of pump becoming warm, the plant having been held up on this account on several occasions before the cause was discovered.

These photographs were taken while the engine was still warm from a run; it isn't so rough as it looks-part of that is oil!

The engine we were going to describe? Oh yes ! The engine, as will be seen from Fig. 8, is of the Uniflow type, and is the only part of the plant which has never given any trouble.

Crankcase is an aluminium casting, and, in addition to its usual function, contains the worm gear (5 : 1) and a split bracket for the pump. Cylinders are of steel, 7-16th in. bore, ½ in. stroke, provided with ports, as shown in the drawing. They are spigoted into crankcase and are a press fit in the exhaust collector, the whole being held together by the cylinder head and the three 8 B.A. bolts shown.

Valves are of the poppet type, case-hardened and worked by the levers seen in Figs. 7 and 8, pivoted in the exhaust collector. Diameter of head 3-16th in., shank 1-16th in., lift .015.

Springs are very light-they have practically no work to do when running and are held in position by screwed washers.

The valve levers are operated by two hardened tappets 1-16th in. diameter, sliding in case-hardened bushes pressed into the crank-case, and which may be seen at the bottom end of valve levers, Fig. 7 and in Fig. 8. These tappets are so inclined as to point slightly below the centre of crankshaft, to give a " trailing " action and prevent chatter, the engine running clockwise when looking " aft."

Their inner ends bear on the centre webs of

the crankshaft, which are formed as cams. The rubbing speed is rather high, but as the webs are shear steel very little wear results.

Once made, this valve gear gives splendid results-one has such a happy knowledge that, whatever else may shake loose, the valve gear will be all right!

Crankshaft is built up and brazed, being provided with a centre bearing-shaft 3-16th in., pins 5-32nd in. diameter; the strength of these shafts is remarkable if properly jointed.

Connecting rods are steel, with bushed big ends of Mr. Groves's pattern, the gudgeon pin and small end of rod being hardened. Rods are $\frac{1}{8}$ in. diameter and drilled through 5-64th in. Pistons are phosphor-bronze and fitted with one ring. It is necessary to make the pistons longer than the stroke of engine to prevent the exhaust ports being opened and thus admitting water to the crankcase when the piston is at top dead centre.

The Pump.

The pump is of Mr. Groves's pattern, and is just as troublesome as pumps always are. so there is nothing more to say about it, except that it is 7-32nd in. bore, adjustable for stroke by the pin and slide-crank shown in the photograph.

When the pump is working water is fed to the boiler through a 3-32nd-in. nickel pipe, via the air bottle and check valve shown in Fig. 4.

Concerning this air bottle, when the plant was being tested, in spite of warnings, *without* a load, curiosity prompted the fitting of a pressure gauge to the top of this air bottle, just to give some idea of the working pressure of plant. The gauge read up to 120 lbs.

Now flash plants sometimes stop unexpectedly; this one did, and by the time things were in condition again, the blowlamp had stored up a good amount of heat in the boiler coils. The hand pump was worked, the engine given a " turn over," and a startling whizz followed-presence of mind remained to open the by-pass and the plant came to rest. Nothing was broken, and, needless to say, the reading of the gauge had not been taken during the excitement.

Now it was noticed that the gauge was registering below zero, and inspection showed the pointer to be *bent !* The pressure must have reached 180 lbs. at least; ever since that gauge has indicated 10 lbs. too low. That proved sufficient warning, and never again was the plant run without a load, in addition the check valve was modified to act as a safety-valve-see Fig. 9.

It will be observed that by-pass and check valve are in one (the sectional drawing will make this clear) and the " safety valve " is that the stop for check valve is soft soldered into the body of the cap, as shown-it has " blown " once only.

Engine Speeds.

The speed of engine has never been taken under load, but steamed from a stationary boiler it ran at 3,500 with 90 lbs. of steam. As an experiment the steam from this boiler was superheated, which added another 200 r.p.m. to the speed of engine.

Slowest speed that engine will run light is about 300; while throttling down to ascertain how slowly the engine could run at about 1,000 r.p.m. a piercing scream arose. The engine was promptly stopped, but everything appeared satisfactory ; another trial was made

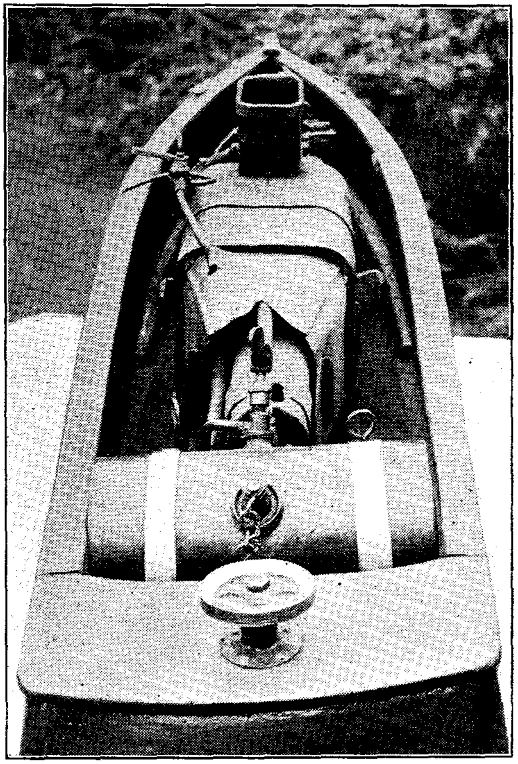


Fig. 2.—Inboard View of "Tortoise I."

with a like result. The cause appears to be that as the steam blows out of the exhaust ports certain speeds are productive of a whistle ; at all events, the sound is always repeated whenever the engine speed is approximately 1,000 revs. Large Uniflow engines are subject to it I believe.

The Boiler.

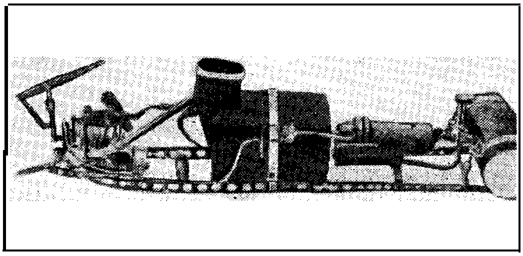
This is a double coil of tube, 6 ft. of 3-16th-in. copper outside and 2 ft. of $\frac{1}{4}$-in. steel inside, both coils being wound on taper mandrels.

Boiler was originally composed of the copper tube only, but this proving insufficient, the inner steel coil was added.

Water is pumped to inner coil direct, the outer copper coil acting as a superheater only.

Boiler casing was once a " Glaxo " tin, it is not riveted but held together by lap joints, as used on ordinary " tin cans "

The front plate of this casing was originally as shown in Fig. 3, but the lamp flame scorched the sides of the boat, instead of heating the boiler coils, so the hood, Fig. 4. was fitted and proved very satisfactory, both as regards shielding the lamp flames and also in giving a much better draught; the lamp smelt horrihly before !



Ffg. 3.-The Original Power Plant.

Casing is well lagged internally with asbestos and is secured to the bearers by the aluminium strap seen in the photograph. All unions are of steel; brass ones, unless of enormous size, will not remain steam-tight for more than a few minutes.

Funnel is oblong 1 in. by 1¼ ins., and has the exhaust directed up it; the aluminium ring fitted to the top gives a pleasing finish. Weight of finished boiler 14 ozs.

The Blowlamp.

The blowlamp, like the boiler, has been " made twice." Fig. 10 shows the old lamp, the present one is seen in position, Fig. 4.

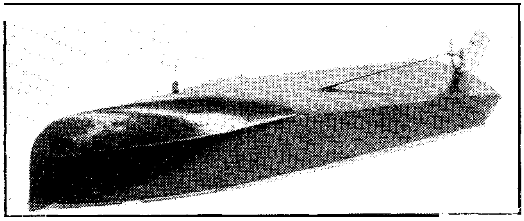


Fig. B.-Inverted View of "Tortoise's" Hull.

This lamp burns paraffin, which is far safer and cheaper than the more usual petrol. Much trouble was experienced with the burner of the old lamp as there was barely enough heating coil to vaporise the oil, this causing trouble when the pressure in the tank varied. To overcome this the attachment sketched in Fig. 11 was made from an old cartridge case and a few parts from bicycle connections In use, one end is screwed into the pump and the other on to blowlamp valve; it being obvious that with this method too great a pressure cannot be pumped into tank once the valve has bean correctly set.

A further trouble was met with in the adjustable nipples, the jet of which had scaled during brazing, the gas from the jet seldom being directed truly along the flame tube. So a new burner was constructed, with additional heating surface, also the nipple was driiled after brazing. This burner was entirely satisfactory, the range of pressure over which the lamp worked being largely increased and the flame much improved.

Container is 4 ins. long, 2 ins. diameter, the ends being flanged and soft soldered in: although unorthodox this has proved very satisfactory, the lamp working at about 15 to 20 lbs. pressure.

When in position it is secured by a V-piece inside the boiler casing, in which the flame tube rests, and to the bearers by the two aluminium straps and spring clips seen in the photographs. Weight of lamp empty 12 ozs.

With these small flash plants a lamp with an adjustable nipple is a necessity; it is impossible

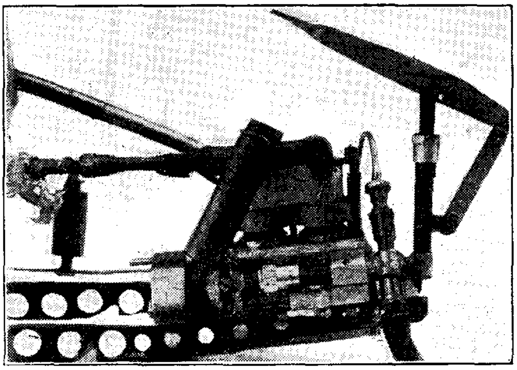


Fig. 6.—The Pump Side of Engine.

to obtain fine enough adjustment with the fuel valve only; in addition, the amount of water pumped by the engine cannot be varied very widely, so that, without an adjustable nipple, the dangers of " red hot " steam on the one hand and flooding of the boiler on the other are more likely to be encountered. Mr. Groves, I believe, first drew attention to the need of control of the gas to lamp. I am greatly indebted to him, not only for that, but the many pitfalls he has given notice of at various times, and the way in which he has placed the results of his experiments on record for the assistance and edification of others.

The Propellers.

Several propellers were made, but before describing these some account of the propeller shaft and skeg is necessary The shaft is +-in. silver steel, being turned down to 3-32nd in., except at the bearings. which arc-, one in the skeg, two in the stern tube-which, by the way,

is only 3 ins. long, and has no gland—and one for the thrust and driver. The thrust is taken by a hardened steel collar running against a phosphor-bronze bush ; the drive being of the usual forked type engaging two pins in the engine flywheel. End of propeller shaft is screwed 5 B.A. for this driver, a small lacking

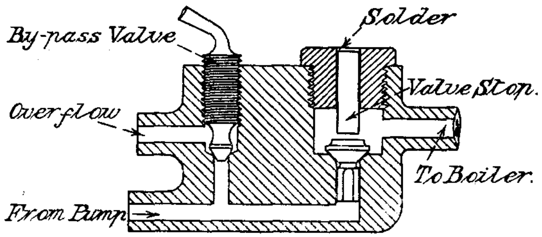


Fig. 9.—Section of Feed Valve Box.

screw being used to prevent the driver unscrewing when the engine is being started; the direction of rotation of the engine keeping the driver firmly screwed up when in motion

The skeg, as will be observed, is at the rear of the propeller, this arrangement possessing many advantages : it enables a very good

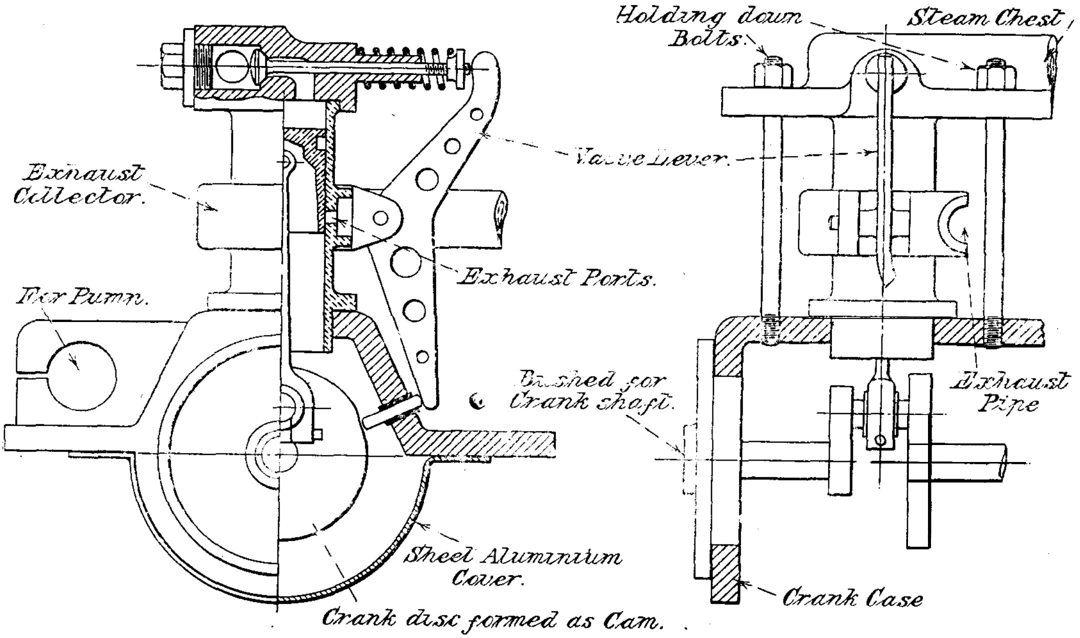


Fig. 8.—Part Sectional Side and End Elevation of Engine for "Tortoise I."

"stream-line" to be given to the propeller boss, forms an excellent "stern-post" for the rudder, and makes for greater propeller efficiency-of which more anon.

The propellers are of conventional design, $1\frac{3}{4}$ ins. by 2 ins. in diameter, increasing pitches af from 5 ins. to 7 ins., the only departure from usual practice being in the bosses, which are all one diameter : $\frac{1}{2}$ in., shown in the section drawing Fig. 13 and the photograph Fig. 12. Reference to Fig. 13 will show the method of securing the propeller to shaft; it requires good workmanship, but is surprisingly light and runs much more sweetly in consequence. Fig. 12

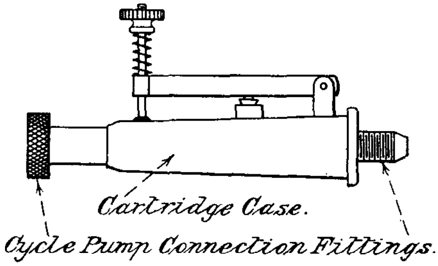


Fig. 11.—Safety Fitting for Pumping up Blowlamp Tank.

shows some propellers in course of manufacture. No. 1 is a propeller ready for turning (note the piece of wire soldered to blades and body to steady same under the cut), propellers being mounted on a mandrel, revolved at high speed and turned to shape, this making all blades alike in profile, the edges being afterwards thinned and blades highly polished in the usual manner. Nos. 2 and 3 are finished propellers, the root angle and tip angle of these blades are not such as to give the same pitch, thus while the tip angle is equivalent to 6-in. pitch, the root angle is only equal to about 5 ins., the idea being that the blade should not do any actual propelling

at the root but merely " follow-up," the theoretical requirement being that root pitch should equal effective pitch, minus slip. This method of construction reduces " rotational wake losses " also. Fig. 12 again . No. 5 is the hardened washer which takes the thrust, No. 7 the driver, both of which fit the other end of shaft to that shown at No. 4, where the driving dogs and steel nose may be clearly seen, and to which the propeller is secured by the tail cone 6.

The most successful screw was a 3-blade one, $1\frac{3}{4}$ ins. diameter, 6 ins. increasing pitch, not shown in the photographs. Trouble was experienced with some screws at anything but moderate speeds, probably " cavitation "—the symptoms were fall of thrust, increase of engine speed and vibration. The greater blade area of the new screw eradicated this trouble ; it is worthy of note that propellers mounted on shafts which are much inclined frequently vibrate badly, due to the varying pressures on thr blades, occasioned by varying angle of blade relative to longitudinal motion during one revolution.

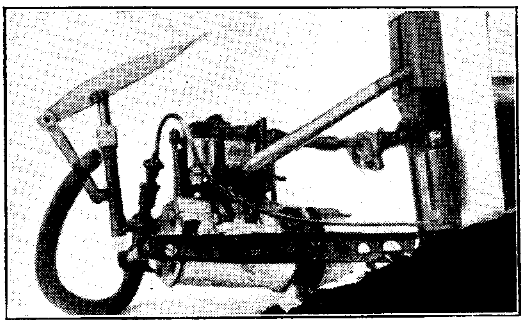


Fig. 'I.-The Valve Side of Engine.

The " rotational wake" losses of these coarse-pitch screws is usually rather large, although minimised bv the decrease of pitch at the root of blade, as-described above.

It is he:-e that the advantage of placing the rudder in this stream from the propeller becomes manifest; for it exercises an excellent influence in "straightening out " the stream. Speed boat men might obtain better results if they experimented with blades of opposite curvature to the propeller, placed immediately in its wake ; in fact there was an apparatus on these lines used in full-size practice at one time, called, I believe, the "Anti-spire" and consisting of a short tunnel surrounding the propeller and fitted with vanes of opposite " hand."

Not onlv would this increase the " propulsive co-efficient," but would reduce the list on the boat and improve the steering.

The cause of single-screw boats needing to "carrv helm " to keep a straight course appears to be due to the fact that the water **below the** centre of screw is a little more " solid " than that above, the screw blades thus meeting with varying resistance during the revolution ; in effect, the bottom blade " gets a purchase " a little in excess of the top blade, and us this slight difference is always in one direction the result is to sn-ing the stern of the boat out of its course-hence the curve.

About Rudders.

Now, if we have a rudder on which the wake from the propeller impinges, the wake rotating

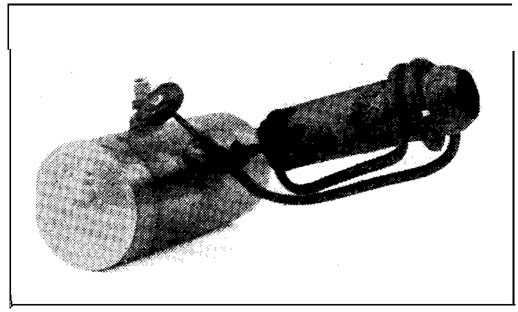
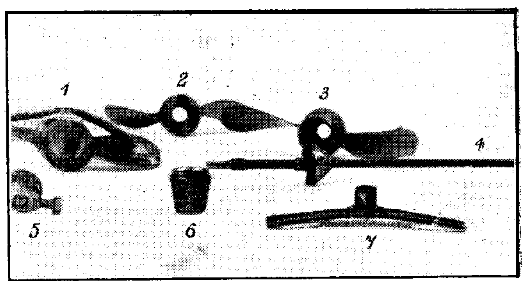


Fig. IO.-The Original Blowlamp.

as explained above and the top area of rudder is larger than the bottom part, we can by a little adjustment of relative sizes make the boat keep a straight course without carrying helm, an improved speed being the result. Experiments on these lines should yield good results, for the losses from this cause on some high-speed boats are tremendous.

No data is available, but the steering of boat has greatly improved since the area of rudder below the centre line of propeller was decreased.



Pig. **12.—The** Propellers and Parts.

Figs. 1 and 5 will show how the rudder has been cut away, the area above the centre line of propeller being now considerably larger than that below.

This rudder is held bv friction only, the socket into which the aluminium wheel shown in Fig. 2 fits being a tight fit on the wheel boss and being split in four places by saw cuts.

These narrow, deep rudders are much more effective steering engines than the shallow long types; experiments conducted in such varying

fields as aeronautics and racing yacht design bear this out. Sailing men have discovered that tall, narrow sails are much more efficient per square foot of area than those of broader but more " dumpy " build; whilst aeroplane designers know that the best lifting plane is long and narrow-the " aspect-ratio," as it is termed, being about 6: 1, or more.

The Final Stages.

" Tuning-up " this boat was a long, thought-provoking, arduous and exciting process. It was during this stage of spasmodic stops and violent but short runs that the boat's name was suggested by my friend Mr. Richard Roe. He, witnessing some of these violent runs, said " Why not name it Tortoise? " I enquired " Why Tortoise? " and received the reply " You know; do you not, that the Tortoise is a ***hare racer*** (hair raiser)? " He was anathematised and banished, but the name remained.

Chief of the difficulties was the adjustment of the supply of fuel and water. The whole plant was new, and pumps are never at therr best

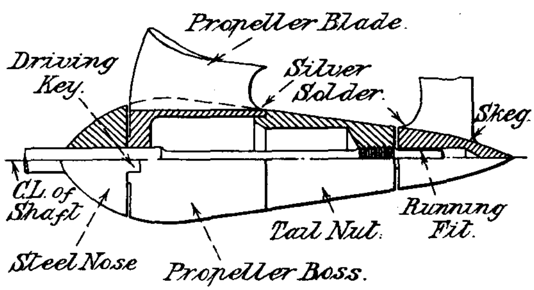


Fig. 13.—Method of Mounting Propeller.

until well " run in," hut a balance was finally obtained and a test tank run of 14 minutes resulted. The engine speed is always slower in those cases where the boat is not free to travel, due to the propeller having no " velocity of feed. "

This run of 14 minutes was judged satisfactory, so the boat was taken to a sheet of water and given a run. When seen running for the first time the feeling of having achieved is very pleasing.

Timing of the boat was, unfortunately, impossible due to weeds. On a later occasion few weeds were encountered and the estimated speed was about 6 to 7 miles per hour.

During the unexpectedly final run on this occasion the boat struck a floating stick which altered the course largely. Now, the edge of that pond is concrete and, in plan, very irregular. Not wishing the boat to hit the bank, a sprint n-as the only hope. As I sprinted, one eye on the boat and the other on that part of the bank which it appeared most likely to hit, but *not* on the part along which I sprinted. . . .

I shall give up building fast boats!

The Other Side of Things.

By " The Cheery Critic."

The Velocity of Light v. Speed of Boats.

THE velocity of light is 30,000 kilometres a second, and, according to American writers, the maximum speed of model boats has so far only attained 70 m.p.h., so boats have a long way to go before they can compete with light, and, relatively, even American boats are more or less comparable to snails. But when our Editor says, on page 428, that " the gap between 25.6 and 30 m.p.h. is not very wide," that is just where speed merchants differ with him. There is a big difference between 25.6 and 30 m.p.h., although by subtraction it only represents 4.4 miles!

Now, 4.4 m.p.h. is quite a nice pace, and could probably be attained with an electrically driven model carrying a full assortment of deck fittings and other paraphernalia and not look too fast to be out of drawing with the original. But (and this is a very big but) added on to 25.6 m.p.h. already attained is quite another question,

It is not possible to state the figures of merit mathematically, but in the writer's opinion they run somewhere round the fourth powers of the speeds ; thus to double the speed would be worth some 16 points, and to increase the speed, as stated above, would mean that the higher speed was 1.896, or nearly twice as good a performance.

The Einstein Theory and Speeds.

Has any photograph been seen showing this boat doing 70 m.p.h., and, if so, is more than the propeller in the water? If only the propeller is in the water, is this sufficient to differentiate between an aero and hydroplane? The writer always thought that when 70 miles was mentioned it was " scale miles " or some other equally American method of adopting Einstein's theory to model speeds.

Relativity 'enters largely into model work if you only look at it from the right objective. Suppose the model were 1 metre long and it did 20 m.p.h., and the grown-up boat 16 metres, according to Froude's law of square root, the large boat would have to do 80 m.p.h. to equal the performance, or, in other words, the model did 80 scale m.p.h.

Scale Strength.

These scale miles, scale tons, etc., make about as useful a comparison as the height an elephant ought to he able to jump when compared to a flea. An elephant is about 2,000 times as big as a flea, therefore he ought to be able to jump 44½ times as high. Now, say a flea can jump 2 feet high, the elephant ought to hop over the Houses of Parliament. Just fancy what a mess he would make if he slipped in taking off, and fell through, the roof during a heated debate on Mespot or Retributions or Mitcham!

To take another example of models and realities. The writer has a wooden spline, ⅛ in.

square by 26 ins. long, which he uses for drawing ships curves, and on occasions has great difficulty in holding it in position bent to the required configuration by means of lead weights. Now, imagine that this is a model, scale $\frac{1}{4}$ in. to the foot, and that a full-sized baulk of timber, 6 ins. square by 104 feet were obtained, it would be quite floppy, and if it were attempted to lift it by a sling round the middle it would hang down like a hairpin, provided it did not snap. The model, however, can be held out by one end with scarcely a visible bend.

This is where the scale strength of materials comes into force, and this is why large reproductions of models fail to equal the performances achieved in miniature.

Model Materials.

To return to the two models doing respectively 25.6 and 30 m.p.h., the probabilities are that in the former the highest available class of materials has already been employed, and as it will be necessary to greatly increase the power to gain the extra 4.4 m.p.h., the improvements must be sought in design and not in material. "That is to say, science must be brought into play on the top of brute force already employed up to the limit. The writer does not mean to imply that the English record was gained entirely by brute force, or that brute force has been absolutely used up to its limit. High-class engineering calls for a large factor of safety, about 4 for steady stresses running up to 8 for suddenly applied forces. In speed boats these factors have perforce to be greatly reduced, and it is by weight cutting (i.e., cutting down the factor of safety) that great things have been done up to the present.

Weight Cutting.

Weight cutting alone, however, will not suffice; the design of the plant must be such that the maximum power can be obtained for the smallest possible amount of steam, provided that the weight of the engine be not increased beyond that saved in the reduction in the weight of the steam generator. The n-hole thing is a question of compromise. Compound, triple, or quadruple expansion engines will give more power than simple engines with a given n-eight of steam (i.e., n-eight of boiler), but it will not help the boat forward if the boiler be reduced by one pound in weight for a given power if one pound has to be added to the weight of the engine. If it was a question of economy of fuel it would be quite another question, but as things are at present it does not matter much whether the plant requires one or ten lbs. of fuel per H.P. per hour. Fuel consumption does enter into the question slightly, because a larger container and heavier blowlamp would be required for the less economical engine.

Speed boat design is a question of give and take. The most perfect engine cannot be used; uneconomical and imperfect hulls must be employed, and propellers run at inefficient speeds to obtain the best results, and although it sounds quite wrong, it is the scientific employment of these imperfections which will produce the record breaker.

The Circular Course.

Many years ago, when Mr. Teague invented the circular course, there was nearly as much ink spilt over the absurd idea that the centrifugal force due to the boat flying round at the end of the string would help to lift it out of the water as has been used in discussing fire *v.* water-tube boilers for locomotives. The facts of the case are that the circular course considerably retards the boat, and this in an increasing ratio as the speed is increased. It is dangerous, if not impossible, to run a model free at the speeds now attained by record breakers unless a stretch of water can be found large enough to allow the boat to run itself out without hitting something. Even if such water were available it would be extremely difficult to record the speeds at which the boat travelled, as it would be impossible to keep her on the course without wireless control, or some such gadget, which would probably weigh more than the plant.

There is, however, another method that might be worked out which would probably take less speed off the boat and ensure her travelling in a straight line.

Trolley Wire Steering.

The proposal is to stretch a wire from end to end of the lake and to thread a trolley on this, which would be towed by the boat. The line towing the boat would be attached to a tiller, which in turn would actuate a rudder on the boat, and bring her back to the true course immediately she departed from a position immediately under the wire. The idea is merely an idea, and has not been worked out or tried, hut it might possibly be found practical. If so, it would allow two or more speed boats to be tried out one against the other, instead of against time; always a much more sporting and interesting sight.

Proposed Classification of Speed Boats.

The new proposed n-eights for the different classes of boat are a great improvement on the old, but could not the whole classification be done away nith by simply taking the actual speed and dividing the result by $\sqrt[6]{D}$ where D = displacement.

The cube root of D would reduce the displacement, or cubic dimensions to linear dimensions, and the square root ot that would reduce the speed of the larger model to the comparative speed of the smaller. The beauty of this formula is that it will enable the designer to proportion his ship to the best relative length, beam, and draft, without any arbitrary preference being given to any particular dimensions, and, at the

same time, enable the clockmaker enthusiast to compete with the clumsier engineer on practically equal terms.

To encourage small models without putting any definite restriction on size, the formula might be modified by allowing the size to be definitely handicapped by including D in the formula, which would then read

$$(a)\ \frac{\sqrt[6]{D}+D}{2} \qquad (b)\ \frac{2\sqrt[6]{D}+D}{3} \qquad (c)\ \frac{3\sqrt[6]{D}+D}{4}$$

which would affect the speeds in the proportion of 1 : 1, 1 : 2, and 1 : 3, according to which formula were used.

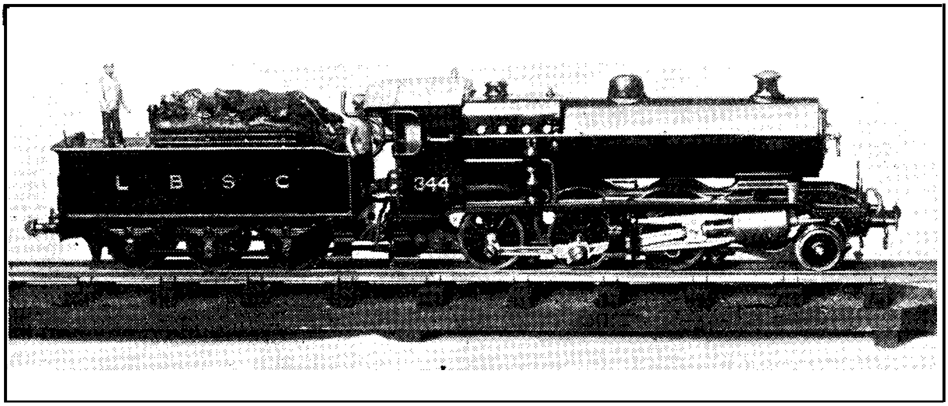
To establish which of the above formula would be best to adopt an analysis of the results up to date would have to he made.

Another reason for adopting the above classification is that, supposing a man tried to build for the smallest class and exceeded the weight by, say, 3 ozs., he would have to compete against a boat perhaps at the top limit of the next class without any compensation.

Two O-Gauge Steam-Driven Locomotives.

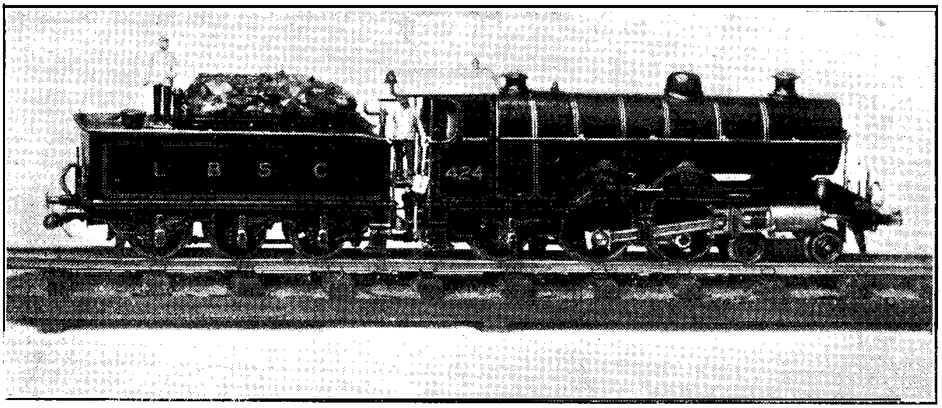
By STANLEY H. M. FISH.

THE photographs reproduced herewith are of two steam locomotives which I have recently completed for use on my o-gauge L.B. & S.C. Railway system. Although o gauge is now by far the most popular size for a model railway, and in the Model Railway Club o gaugers outnumber all the others put together, yet the steam



An 0 Gauge Steam L.B.S.C.R. Working Model.

model in o gauge is conspicuous by its absence, and during the last 15 years or so I can only remember two having appeared in THE MODEL ENGINEER, *viz.*, Mr. Averill's in 1910 and Mr. Money's in 1912, and of these only the latter



The L.B.S.C.R. Steam-driven "Atlantic," 0 Gauge.

bore any resemblance to an existing English prototype.

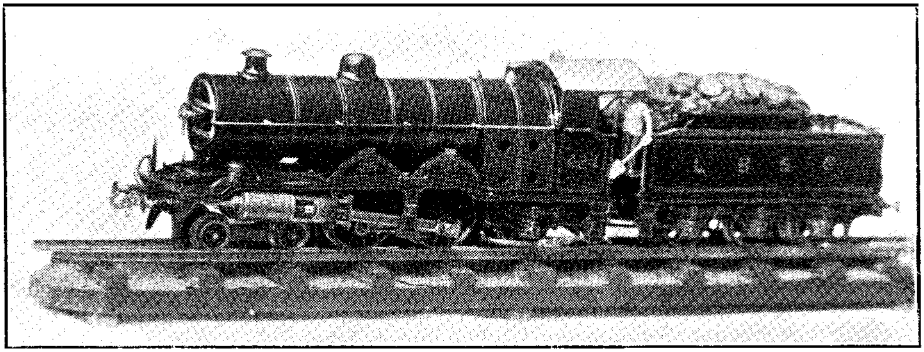
It has long been supposed that it is almost impossible to build a successful o gauge steam model, except to an abnormal or freak design, but, as will be seen from the photographs, these

two models are of existing and well-known English prototypes, both of quite normal dimensions, and both have (turned out to be extremely successful working models, and since their completion some time ago have run many miles under their own steam, and have given no trouble whatever. The two models being very similar in construction, were built simultaneously, a plan I have found very profitable when making the clockwork locos. which compose the rest of my stud, but owing to the dearth of suitable materials and parts the task took nearly two years. With the exception of the regulators and taps from Messrs. Bassett-Lowke nothing could be obtained from any of the model trade firms, and but for the kindly help of fellow enthusiasts and club members the models would never have been completed.

The cylinders were picked up piece-meal from various sources, and several missing parts had to be made. They are of the piston-valve type bottom one being fitted with an outflow pipe below the footplate for discharging the water left in the boiler after each run.

The spirit lamps have five burners and are supplied from the tender by air displacement, and the behaviour of this system is excellent—the fire remaining absolutely steady throughout the run, and though derailments have not been infrequent yet no mishaps have occurred with the fire ; and seeing that the line is in the sitting-room and passes close to the curtains this speaks well for spirit-firing. The tenders are fitted with separate zinc water tanks and feed pumps, but these are little used as the boiler gives over half an hour's continuous running with one charge of water and fuel. The brake handle on the tender work an arrangement for pinching the rubber tube and shutting off the spirit, when filling the air-tight tank.

The leading dimensions of the models are as follows :



An 0 Gauge Spirit-Fired L.B.S.C.R. " Atlantic."

with inside admission and work very well indeed, giving a sharp, clear beat. The eccentrics, which are of the slip variety, are situated on the leading coupled axle between the wheels and the frames, the latter being pinched in to allow the necessary working clearance. The connecting and coupling rods are of steel, fluted out with a hand-scraper, using a straight-edge as a guide. This was a long and very laborious task, and in future I shall use German silver for these parts. The cylinders are lagged with asbestos and Russian iron, and lubrication is supplied through the dummy tail rods, which are of German silver rod, drilled hollow. The steam is superheated by being passed close to the burners and the exhaust pipes deliver into the chimney and give a very realistic white plume when the engines are running.

The boilers are of the plain, externally-fired type with two vertical flues-one through the dummy safety-valve casing and the other through the chimney. The boiler fittings comprise safety-valve under dome, whistle, regulator, clack valve and two gauge taps-the

Gauge $1\frac{1}{4}$ ins.
Scale 9-32nd in. = 1 ft.
Cylinders 7-16th in. bore by 9-16th in. stroke.
Boilers $1\frac{7}{8}$ ins. outside diameter by $9\frac{1}{4}$ ins. long over-all.
"Atlantic" coupled wheels $1\frac{3}{4}$ ins. diameter.
" Mogul " coupled wheels $1\frac{1}{2}$ ins. diameter.
Height of boiler centre $2\frac{3}{4}$ ins.
Length of each engine over buffers $19\frac{1}{2}$ ins.

The " Atlantic " will start away with six bogie coaches, and pulls lustily, making steam as she runs, and even with this load the speed is such that she only just keeps the track. The goods engine too pulls about a dozen trucks at a steady rate and labours in a very realistic manner over the up grades. Both engines take the sharp curves of my line quite well, though the former are only 3 ft. radius and the latter only 26 feet in circumference.

In conclusion, I should like to say that there is a peculiar pride and very great pleasure and satisfaction to be obtained from successful working models of one's favourite prototypes, especially when they remind one perpetually of

happy holiday at Eastbourne and the sunny South Coast. I have enjoyed many fine runs behind " Atlantic " Xo. 424 between London and Eastbourne.

I also wish to express my very best thanks to Mr. G. P. Keen, Mr. W. R. S. Smart and Mr. Charles Pond, of the Model Railway Club, and to Mr. Guy Edwards, of Keymer, and Mr. Watson, of North Road, Brighton, who so kindly assisted in providing the necessary materials and parts.

I have not joined in the discussion on firing **boilers as** I am not a $\frac{1}{2}$-in. scale man, but if any *M.E.* readers are sufficiently interested and would like to see what methylated spirit can do in o gauge, I should be only too pleased to shorn them if the Editor will kindly put them in touch with me.

M. N. (Chertsey).—You could go ahead and get everything ready to make a start directly licence is received. To be precise you must not operate until then.

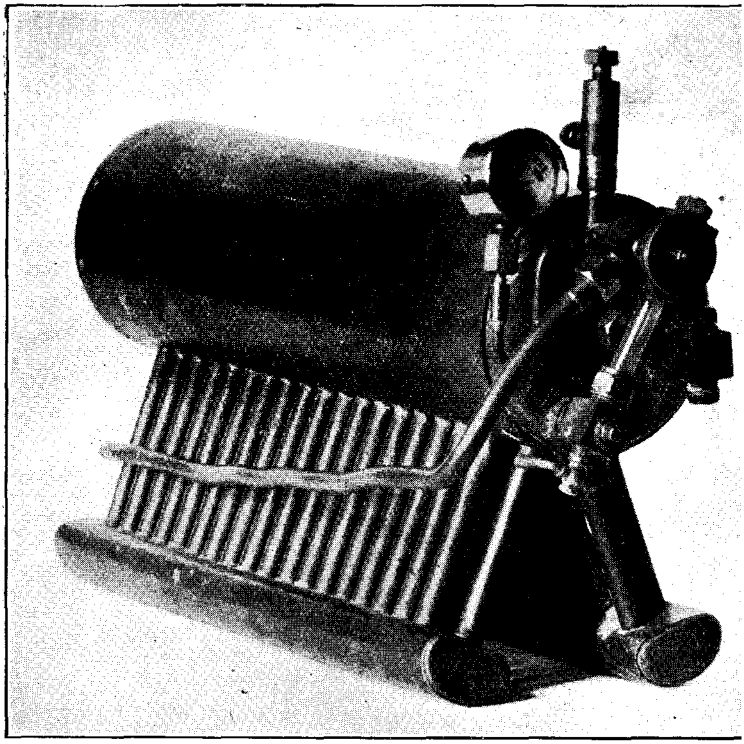
J. W. H. (Rochdale).—We are sorry n-c cannot give you the addresses you require. Possibly your local newspaper would be able to supply them. Write to Gamage's, Holborn, London, for prices of slugs.

A Model Yarrow-type Boiler.

By K. L. Meyer.

The following supplementary notes relating to the Yarrow boiler, described in the *M.E.* ***of*** July 27, 1922, may be of interest.

Since the report of the demonstration at the S.M. & E.E. workshop (when the boiler ran Mr. Barrett's $1\frac{1}{2}$-in. by 2-in. double-acting engine at 1,100 r.p.m), it has supplied steam for Mr. Kennion's converted motor-cycle engine, $2\frac{3}{4}$ ins. by 3 ins. which is fitted with a piston valve in place of usual poppet type valve—at quite a good speed and maintained a pressure of about 40-50 lbs.



A Model Yam-x-type Boiler.

I might mention that I was quite as astonished as the other members who witnessed the performance ; we imagined that the boiler would be almost emptied in warming the cylinder up. but as a matter of fact the engine got going after about three revolutions by hand.

There are one or tn-o slight errors in the report which I will take this opportunity to correct ; (1) All fitting. except pressure gauge were my on-n make, the safety valve being made of I lex. brass rod with iinife-edged valve seating and a $-bronze ball spring-pressed to blow off at 100 lbs. per sq. inch ; (2) The silver solder was bought in n-ire form 16 gauge and n-as drawn don-n by a friend to about 23 S.W.G., this n-hen made into rings of 5-6th in. diameter heing of ample size to form a nice radius round each joint--one ring being used at either end of each tube.

I would like to emphasise the advantage of using light gauge water tubes n-here quick steaming is required, as many model boilers appear to be unnecessarily heavy and of lon efficiency owing to tha use of tubing altogether too thick. As mentioned in the report a piece of the 5-16th-in. by 24 g. copper tube used for the boiler was tested hydraulically to 1,000 lbs. per sq. in. nithout any visible sign cf distortion, so I think this goes to prove that it is possible to get strength with lightness and improved efficiency.

A Design for a Model Compound Condensing Steam Engine-II.

By "Axle."

(*Continued from page 254.*)

We mill now deal with the condenser tube plates, Fig. 6. They are made from sheet brass and filed up to shape, and are drilled to suit ¼-in. diameter brass tubes. These holes should be very carefully drilled to secure accurate spacing of the tubes. The tube plates should be lightly covered with solder or tinned on both sides to obtain a good joint when the tubes are finally sweated in.

Fourteen holes 9-64th in. diameter are drilled round the tube plates through which pass the studs holding the condenser covers.

The tube plates are held to the body of the condenser with six So. 5 countersunk head screws. it should bc observed that the countersinking of the tube plates make them R.H. and L.H. The tube plates may now be used as gauges from which to mark off the holes in the end of the condenser. Twenty holes are drilled and tapped So. 5 B.A. in each end and 14 studs fitted for attaching the covers. The ends of the condenser should be covered with a very thin

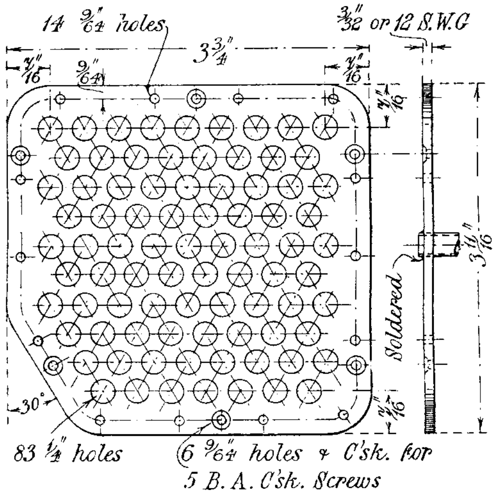


Fig. 6. Tube Plates.

Setting Out for Condenser Tubes.

layer of solder, so that when the tube plates and covers are finally fixed in position, a soldering-iron can be run round the joints to make them perfectly tight.

Little further can be said about the condenser until several of the other castings have been described. Firstly, we will deal with the air pump barrel, Fig. 7. This par! is made from a gun-metal casting, and is turned all over in the lathe. The casting should be made 1 in. longer than the finished length for chucking. The barrel has a spigot at each end, one which registers with the bedplate, and the other with the hotwell casting. The spigots should be a push-fit into the parts with which they register, and the bore should be smooth and parallel. It

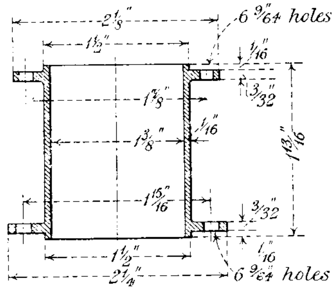


Fig. 7. Air Pump Barrel

Section of the Air Pump Barrel.

may be mentioned that on dimensioning the drawings no allowance has been made with regard to the limiting dimensions required to obtain the various fits, because the engine being dealt with is not one in which interchangeability is required, and the fit will be obtained in

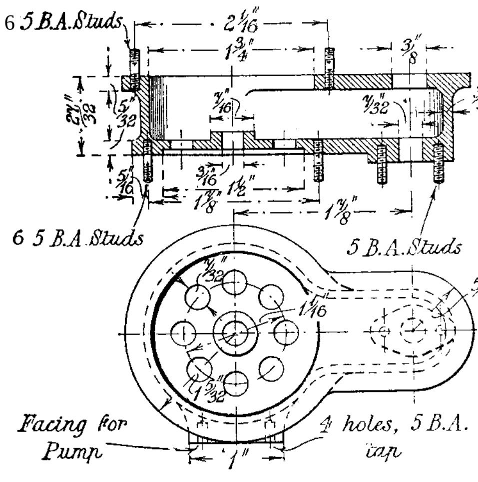


Fig. 8 Hotwell

Section and Plan of the Hotwell.

practically all cases by trying the parts together in position, or with the skilful use of callipers, Yet there is no reason why the fitting parts should not be machined to definite limits, such as are given in Newall's tables and to be found in the majority of mechanical engineering pocket books. This method of obtaining pre-

cision mill necessitate the skilful use of the micrometer.

The flanges of the air pump barrel are drilled with six 9-64th-in. holes in each, to suit the studs in bedplate and hotwell.

The casting for the hotwell is of gun-metal, Fig. 8. In Fig. 2 the head valve is shown as a separate part, but there is little reason why the head valve should not be in one piece with the hotwell. In any case, details of design such as this are left to the choice of the builder.

The casting should first be bored out for the cover, faced across the top and the valve seat. It can then be turned over and the recess machined to suit the barrel. Six No. 5 B.A. studs secure the air pump cover and six similar studs secure the hotwell to the barrel. The oval flange on the underside is drilled $\frac{1}{4}$ in. and is also filled with two No. 6 B.A. screws for attaching the suction pipe to the feed pumps. Instead of an oval flange a screwed union may be used. (It is the opinion of the writer that the B.S.P. connections are rather bulky for small work, and special connections, which can be obtained from any firm of model engineers, should be used in all cases where a screwed pipe connection is required.) The valve seat has eight holes 7-32nd in. diameter drilled in it.

The circulating pump is double acting. The body of the pump is shown in Fig. 9. It is made from a gun-metal casting. The making of the patterns should be fairly simple. The barrel of the pump can be cast solid if desired. The valve box of the pump is separate from the body. Having obtained a suitable casting, it should be machined across the face upon which the valve box rests. This face will then form a flat surface upon which the casting can be attached to an angle-plate fixed to the faceplate of the lathe, to enable the barrel to be bored out. The top and bottom of the barrel should be slightly chamfered. The top of the casting can be bored and faced for the cover at the same time. The brackets holding the pump to the condenser should be machined parallel to the bore. The loner edge of the bottom bracket should be machined and filed up parallel with the cover face. This edge registers with the lip machined

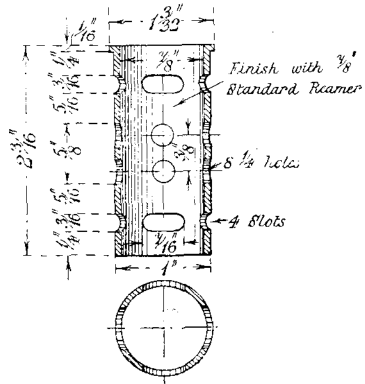


Fig. 10. H.P. Valve Liner, (C.I.)

Section of the High-pressure Valve Liner.

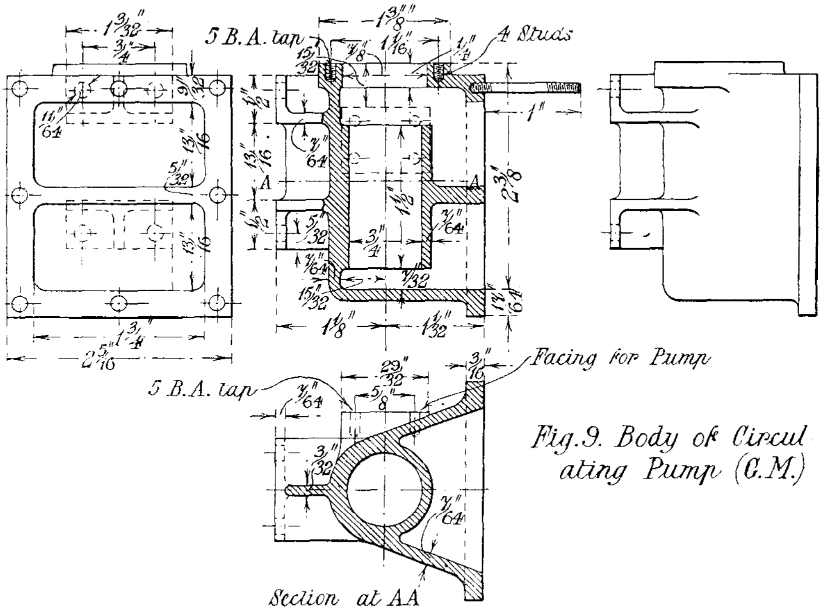


Fig. 9. Body of Circulating Pump (G.M.)

Part Sectional Elevations and Plan of Circulating Pump Body Casting.

on the back of the condenser, which takes some of the load from the studs and also forms a means of alignment when fitting up the pump to the condenser.

The cover is held on with four No. 5 B.A. studs, and the casting should be drilled and tapped to suit. Eight No. 5 B.A. studs 1 in. long secure the valve box and the cover.

On one side of the pump there is a facing, upon which is attached the feed pump. This facing is drilled and tapped for the four No. 5 B.A. screws which hold the feed in position.

Having now somewhat briefly described the making of the chief parts of the model, we will deal with some of the minor parts required to complete the cylinders. Referring to Fig. 2, it will be observed that the H.P. steam-chest is fitted with a liner in which the slide valve works. The liner is shown in Fig. 10. It may be made of cast-iron or mild steel. A piece of mild steel solid drawn tube 1 in. outside diameter by 16 S.W.G. thick would probably be suitable. If the liner is made of cast-iron it should be made 11-16th in. outside diameter, thus making the thickness 3-32nd in. Suppose the builder decides to make the liner of cast-iron, a suitable piece of metal should be fixed in the lathe chuck and a hole drilled down the centre, say, 13-16th in. diameter by $2\frac{1}{2}$ ins. deep. The outside should then be rough turned down to slightly over size. The inside can now be bored out to size and lapped to obtain a smooth, parallel bore. The liner should be turned to a light force fit into the cylinder. Before parting off the liner, the position of the steam ports should be marked on with the point of a screw-cutting tool. The liner may now be parted off to length. The slots forming the steam ports can now be drilled out and finished off with the file. Eight $\frac{1}{4}$-in. holes spaced as shown on the drawing form the exhaust pork. The liner can now be fitted into the cylinder, being dramn into

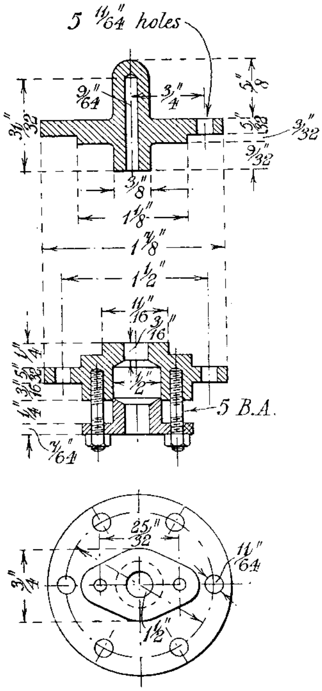


Fig. 11. H.P. Steam Chest Covers, G.M.

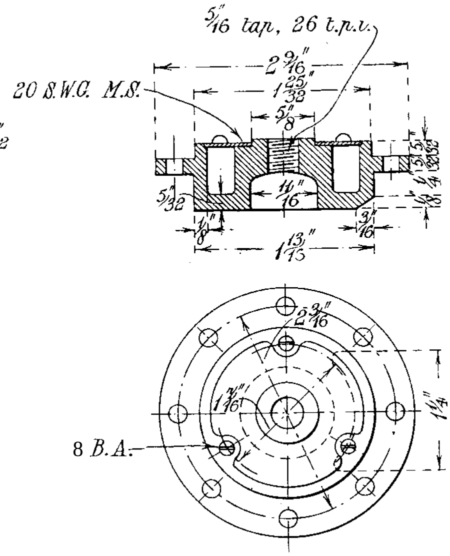


Fig. 12. H.P. Cylinder Cover, C.I.

Details of the H.P. Cylinder Cover and Steam Chest Cover.

place with a i-in. bolt and washers. If the liner seems too tight, it should be withdrawn and eased slightly on the hard places. The liner should draw in with a moderate pressure on the spanner. No attempt should be made to drive it in with a hammer. If necessary the bore of the liner can be lapped out with a suitable parallel cast-iron plug and emery powder.

The top H.P. steam-chest cover, Fig. 11, is made from a gun-metal casting. It should be placed in the chuck and the dome and outside turned up to size and polished. It should now be reversed end for end in th- chuck and set true for driliing the 9-64th-in. hole up the centre.

This hole forms the guide for the top end of the valve spindle. The cover has a spigot which should be turned to a push-fit into the cylinder. Five 11-64th-in. diameter holes are drilled in the cover. The bottom cover is also made of gun-metal, and has a stuffing box, into which is fitted an oval-flanged gland. The gland should he an easy push-fit into the cover. Both gland and cover are bored $\frac{1}{4}$ in. diameter to suit the valve spindle. The gland is adjusted with two No. 5 B.A. studs and nuts. The gland may he turned from bar or from a casting. The cover has six 11-64th-in. diameter holes drilled in it. The H.P. cylinder cover, Fig. 12, is made of cast-iron. provided three bosses to be drilled and tapped for the screws securing the lagging, and has twelve holes 11-64th in. diameter drilled in the flange.

The L.P. steam-chest, Fig. 14, is made of cast-iron. The steam inlet is on one side near the top. Both sides of the casting should he machined in the lathe, after which operations it should he set up on an angle plate in the lathe and bored out for the gland and valve spindle. The hole for the valve spindle should he bored right through the top of the casting, afterwards opening the top hole out to 5-16th in. diameter to suit the valve spindle guide. The facing for the valve spindle guide bracket should be

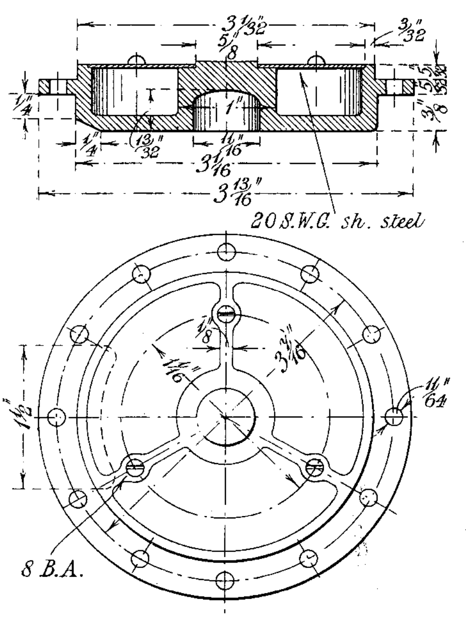


Fig. 13. L.P. Cylinder Cover, C.I.

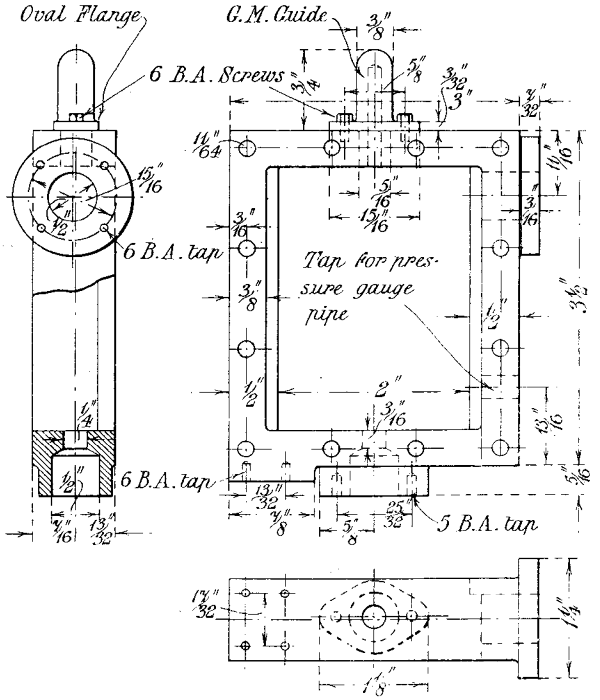


Fig. 14. L.P. Steam Chest, C.I.

Details of L.P. Cylinder Cover and Steam Chest.

It should first be turned up and polished on the outside and recessed. The cover should he drilled, tapped, and faced for a suitable lubricator. The underside of cover should be turned to a push-fit into the cylinder. The cover is bevelled on the side which comes opposite the steam port and is recessed for the piston nut. This recess and the underside should he cleaned up while the cover is in the lathe. A piece of sheet steel should he cut to fit the cover and fixed with three No. 8 B.A. screws. Eight holes 11-64th in. are drilled in the flange of the cover to suit the securing studs.

Fig. **13** shows the L.P. cylinder cover. The above remarks on the H.P. cover also apply to the L.P. cover. It has three ribs in which are machined when the stuffing-box is being faced across. The valve box should now be reset for facing up the steam inlet flange. Two narrow strips are cast on the inside of the valve box, which should he machined or filed up parallel to each other to form a guide for the slide valve. The casting must now have twelve 11-64th-in. diameter holes drilled to suit the securing studs and ten No. 6 B.A. 'tapped holes, four in the steam inlet flange, four in the facing for the guide bracket and two for top valve spindle guide. It is tapped for two No. 5 B.A. studs for adjusting the gland. The H.P. and L.P. glands are of the same dimensions.

(To be continued.)

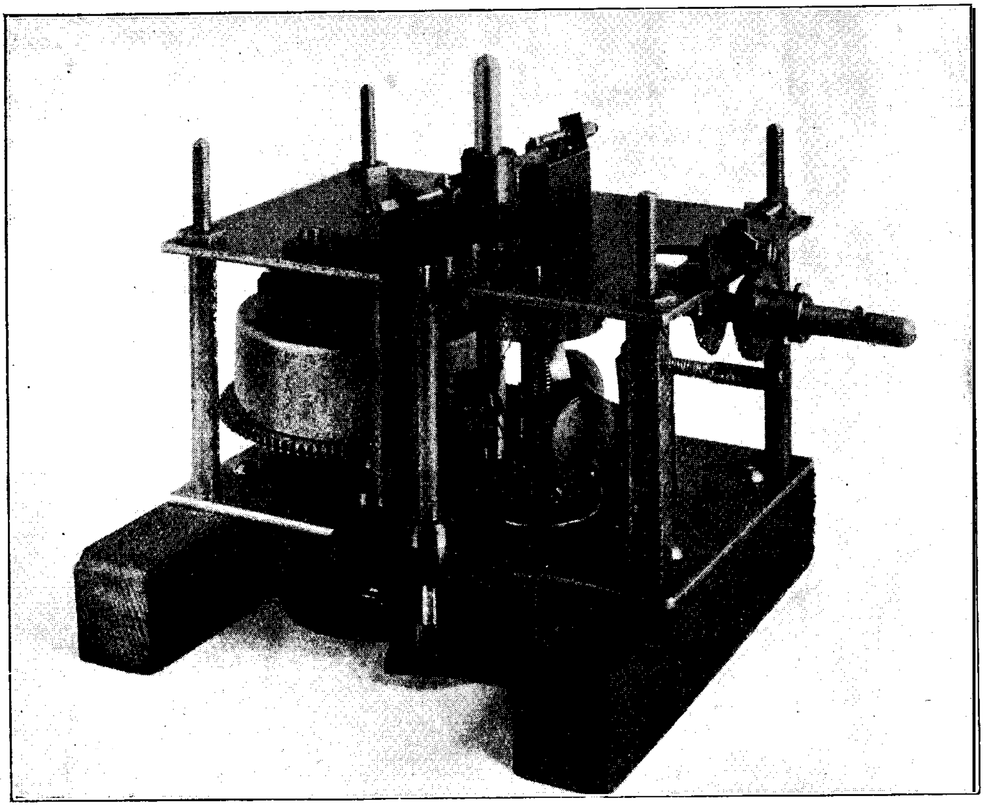
A Spring-driven Time Switch.

A Gramophone Motor Adapted for Operating a Time Switch.

MR R A. ALLMAN of, the Society of Model and Experimental Engineers, whose work in fine modelling is quite well known ta readers of the *M.E.*, has placed at our disposal some notes relating to the adaptation of a spring-driven motor for the purpose of illuminating a model intermittently. This he has applied to the intermittent lighting of the cab of a model locomotive, which was shown at both the 1922 and the last *M.E.* Exhibition. In both cases the apparatus ran successfully through the week of the Exhibition, and the idea as carried out by him, and amended, in order to increase its efficiency, should be of great use to readers requiring to produce some automatic form of intermittent lighting. It would apparently be a good idea to apply to a model of a lighthouse to produce the idea of occultation, without fitting the occulting apparatus. The latter is really an apparatus which hides the light for a given period, whereas this intermits it by putting it out, but from the point of view of realism it should answer well. He nrites as follows :—

The following notes really owe their origin to a desire to illuminate at intervals, by means of a small electric lamp, a model at the 1922 *M.E.* Exhibition, and to the fact that some form of prime mover was necessary for the purpose.

The desiderata were: the 'equipment to perform the duty with the minimum expenditure of energy to be simple and inexpensive and work involved to be as little as reasonably possible. A clockwork mechanism appeared to fill the bill and was decided upon. The advertisement columns of the *M.E.* announced that gramophone motors were for sale in an adjoining district and a visit resulted in the purchase of the gramophone motor which may be seen in its adapted form by reference to the illustration. On examination the motor was found to bear the number 5, which refers possibly to the size, and generally proved to be well constructed. The turntable spindle made approximately 80 r.p.m., at which speed the governor made 700 r.p.m. ; duration per wind under these conditions was not definitely ascertained but was a matter of a few minutes only. As ample



The Gramophone Motor **as** arranged with New Gears to give a **reasonably** long run per wind.

power appeared to be available and for convenience, 1 r.p.m. was decided upon as the speed of the turntable spindle (of this more anon), the turntable spindle to carry the nipe contact. All existing arbors were utilised and position of governor tetained, the portion of the pinion teeth on the governor spindle then in mesh with the last spur wheel of the train being turned off. A visit to Clerkenwell produced the necessary wheels and pinion wire and the two arbors seen in the front in the illustration mere added ; the ratio of turntable spindle r.p.m. to governor r.p.m. was nom 670 :1. So far the job had been plain sailing but on test after assembling it was Found that the gear ratio and frictions of the extra pivots, notwithstanding the provision of clockspring footsteps for the added arbors, almost completely absorbed the power exerted by the spring. A tension spring was fitted over the governor spindle and attached to the suspension collar and the sleeve to keep the weights further spread ; a flywheel also was added resulting in a slight reset-\-e of power over a longer period.

The electrical portion requires but little explanation. The illuminated period chosen was 20 secs. with a 10 secs. dark period. The wipe contact consisted of a vulcanised fibre cylinder on which was mounted a piece of brass tube, two portions of which were cut away in the way of one of the brushes to correspond nith the dark periods ; the spaces were filled in aith fibre and the whole finally skimmed up, presenting a true peripheral surface to travel under the brush. The brushes themselves, of the hammer adjustable tension spring controlled type, were mounted on brass terminal plates which aere secured to fibre blocks attached to the top plate of the motor. Trial under service conditions was now made and did not prove entirely satisfactory, the reserve of power being insufficient to enable efficient brush contact to be maintained. There was now nothing for it but to reduce the gear ratio, and with the opening of the Exhibition at hand this was undertaken as an eleventh instant job. A nen pinion was cut and mounted on a new governor spindle and a new spurwheel to mesh with this n-as cut and mounted in place on its arbor. The turntable spindle was now arranged to make 2 r.p.m., the governor making 612 r.p.m. A new wipe contact was made having one dark period with an included angle equal to 120 degrees. Trial, after reassembling and with efficient brush contact. was quite satisfactory, the motor being full of life and having reserve power.

The motor was secured in a rough wooden box to protect it from dust and damage and an adjustable resistance attached to the box was wired up in circuit with the $3\frac{1}{2}$ volt lamp (a burnt-out lamp was the reason for the addition of the resistance). The motor runs for $1\frac{3}{4}$ hours per wind and made a non-stup run during the hours the 1922 M.E. Exhibition was open.

The original retaining device for the winding shaft cf tbis motor consisted of a spiral of spring steel wire encircling the shaft, one end being taken up to and made fast to the top plate of the motor. This arrangement from the viewpoint of use has one recommendation-silent operation ; considerable excess effort during winding is, however, required and the severe work to which the spring is subjected in the length leading from the shaft to the frame resulted in fracture a: a point in this length on one occasion whilst winding-up during the Exhibition (minding handle and knuckle came into close contact very suddenly, the former not appearing to suffer), and for the remaining period the retaining device consisted of a temporary lash up with a piece of string The ratchet and pan-i were added subsequently.

Some Problems of Model Engineering.

By Dudley W. Walton.

I OFFER these few suggestions as a tenderfoot treading on very thin ice, for nearly all that I know about model engineering has been learnt by visiting the last three exhibitions.

Now of the models you so proudly show, some are merely toys, others are miniatures, a few only are models in the true sense of the word. Hardly any manifest any real grasp of n-hat I conceive are the real problems of model engineering.

For instance, some of you make an engine more or less of the marine type, and, having contrived by handicraft, ingenuity and inventiveness to make it work, insert it in a hull which is always more or less of a misfit. This is not model engineering ; it is merely aggregation, not synthesis. In so far as trying to make an efficient marine engine is concerned, it is beating the air. The problems of marine engineering have all been so thoroughly studied and so thoroughly solved that improvements in methods of boat propulsion call for a greater degree of genius than one who solely devotes his time to models is likely to possess. A youth ambitious to become a marine engineer might profitably devote his spare *time to the making of models, but it would pay much better, in the phrase of Lord Bacon, to "study the mathematics."

The Hull Problem.

Designing a hull for a power-boat is a different matter. Here opportunities exist for model marine architects, remembering, however, that it is known that a small model of the best-designed racing yacht ever launched never

has a sailing efficiency proportional to its original. This is mainly because the friction of a model, both as regards section and surface, varies inversely with the size. There are other reasons, the mathematics of which can be profitably studied. In the past improvements in the shaping of hulls have been largely due to trying out new designs of small boats on lakes and 'rivers. It would probably cost no more in time and effort to build, say, a twelve-foot dinghy than it does to construct a twelve-inch model. A preliminary model of the dinghy might be valuable as 'illustrating the method of construction, the model not being a miniature boat, but an illustration of the finished article.

I note, however, from the trade exhibits, that a model marine engineer can buy a ready-made hull of good proportions, and that some members have addressed themselves to the difficult problem of fitting a machine to such a hull. The result is mostly to fill the entire hull with machinery! This leads nowhere. The problem is to illustrate how to make a boat to serve some useful purpose. In some of the models at the show there was not even room for the stoker! A thing does not cease to be a toy merely because it is called a model boat and exhibited by a member of a power-boat society.

Railway Efficiency.

I observe that by far the most popular pursuit of the model engineer, young or old, is to attempt to make a model railway locomotive. It is a great achievement, I admit, for a beginner to make anything that works, if only by clockwork, and the model locomotive, when made, has a perennial and expanding interest. It links itself up with the problems of railway engineering, and especially with the moire obvious problems of speed, drawbar pull, track-laying, and automatic signalling. I cannot see, as far as the things shown go, whither all this patient contriving leads. Real locomotive engineers no longer devote their whole attention to making the wheels go round. They are looking to-day for heat economy and especially for fuel economy. Engineers of the Line demand not only mechanical, but also commercial efficiency. It does not pay to make the fast train go faster. an achievement which in the past has been so often an advertising stunt. It does not pay to make the engine any bigger, because that means, for one thing, stronger bridges. But it dotes pay to make an engine last longer and do moire work; hence the recent development, for example, of the Weir feed-water heater. The "type" of a locomotive has very little to do with railway economics. The Southern Railway still runs L.S.W.R. No 30, which must be nearly forty years old! I wonder how long, proportionately, is the life of a model locomotive? Did any model engineer make a loco forty years ago which is working to-day?

Locos and Motives.

The railway problem is concerned not with the loco, but with the motive. The demand is for an improved traction unit-the train and all its appurtenances. Look at what the London Underground is doing ! Go another mile for the same amount of energy and lubrication; squeeze a few more sardines into the compartment; find room for a few more (or less) straps ; improve the acceleration and deceleration ; reduce the risk of accidents; and you are earning dividends. So many of the models in your exhibition, it seems to me, are merely miniature copies of inadequate and even obsolete solutions of traffic problems. A boat designer whose habit it is to develop another man's ideas might get a few hints from your marine exhibits; but I cannot imagine a railway man obtaining any kind of inspiration even from the very best bemedailed model at the Horticultural Hall. A loco model may have a very beautiful whistle, and five coats of varnish to conceal the imperfections of its fitting, and yet hare no bearing at all upon real railway work.

Heat and Fuel Economy.

I have mentioned heat economy and fuel economy. These are pressing problems in all branches of heat engineering. I quite understand that it doles not matter in the least to a model engineer whether it costs him 3d. or 6d. an hour to run his engine. Perhaps a competition to run a unit-load on a gill of spirit, or, better still, to evaporate a fixed measure of water, might take some of the gilt off a gingerbread prize-winner. To the power engineer, of course, the difference between a heat efficiency of, say, 30 per cent. and 60 per cent. is fundamental. Here the problem is not so much to improve a 60 per cent. up to 70 per cent., because mechanical heat-utilisation is not the same thing as commercial efficiency. The problem is on the lower levels—to get another five or ten per cent. out of the 30 per cent. efficiency. No one can gather at the exhibition that the fuel problem exists in the model engineering world. Yet there are manifaid problems connected with the utilisation of oil, peat, coke, gas, and an ever-increasing range of patent fuels now competing with coal as prime-movers. Model calorimeters and such devices are not beyond the range of the mode! maker. There are many problems connected with the treatment of raw fuel to make it give up its heat units more easily, and there are possibilities in the direction of model cooking-ovens, automatic stokers, producer-gas plant, Diesel engines, and the saving of labour at every stage of operation. It is safe to prophesy that within 'the next few years all existing gas works plant will be modified or scrapped, and certainly there is a better future for the young engineer who will devote himself to fuel than there is for the

man who turns and drills the neatest fitting. Turning uses only the hand and eye; engineering utilises the brain.

Road Transport.

There are directions, too, in which the model engineer might extend his activities, apart from railways, boats, and aeroplanes. There is, for instance, road transport, which is threatening to make railways obsolete except for the heaviest loads and the longest distance. It is probably easier to make a model steam or petrol lorry and trailer (or even a motor-cycle carrier) than a locomotive and train. The lorry problem can be tackled at close quarters. The "undertype" steam wagon, such as the "Sentinel," is well worthy of study, combining as it does the virtues of the marine engine and the motor car. In road transport the problem is truly synthetic-not aggregative-requiring a completely correlated machine and accessories, and not merely, as in the locomotive, the co-ordination of diversified elements. Historically a loco is merely a stationary engine mounted on a stage coach. Mechanical road transport involves load-carrying efficiency in the terms of wages, fuel, lubrication, steering, minimum repairs, close control, and other similar problems. There is a big field here for model engineers; solving new problems, Instead of repeating old experiments.

Hobbies and Careers.

There is one aspect of model engineering as a hobby for young people upnn which I think very little, if any, emphasis has been placed. I mean in relation to life vocation. Obviously, one whose touch is so delicate that he can turn out an engine to stand on a threepenny bit, or a miniature Atlantic liner to cruise in the soup plate, is not utilising his gifts if he stops short at model making. Such a youth should seek an outlet in, say, instrument making or horology. The great James Watt was an instrum&t maker, and Lord Kelvin devoted some attention to pendulums. There is a big field opening in metrology. Standard instruments for measuring all kinds of quantities, or for determining all kinds of qualities, are getting to be so delicate that they are kept in electrically-heated double-walled chambers in which, paradoxically, the air is frozen to get rid of all traces of moisture. Again, there are numberless self-recording devices awaiting invention and improvement. Horology is an extensive field for those who have talents for exactitude. The Kew statistics show the overwhelming superiority of the hand-made timepiece. Where is the model maker who ever made a wooden clock like that of Harrison, which, made in 1715, is still telling the time in South Kensington Museum? The museum is full of inspiration for model makers.

A Little Bit of Wireless.

Much more might be said on the problems of model engineering, which, on the one hand, are greater than those of simple model-making, and, on the other, only a little less than those of the real engineer. I will offer one fine illustration from the sphere of wireless communication. It is evident that those interested in the sale of wireless equipment expect the radio hobbyist to spend, say, £10 or £20 on his initial outfit. I record Edison's remark when, largely as a result of his own enterprise, he first saw a street lighted by electric arcs: "What we want is a little bit of an arc lamp." Edison wasted no time in making a miniature arc. He went back to his laboratory and invented the incandescent lamp.

What is wanted is a little bit of wireless. I remember, some thirty years ago, that one could buy for a shilling a little packet of gadgets which when put together made a model electric telegraph. This was a real model; it illustrated on a small scale the principle of electro-magnetic telegraphy. Compared with the real thing it was a toy, but it worked. That shillingsworth of successful experiment led, naturally, to further investment. Why cannot one buy a few shillingsworth of wireless—enough, say, to pick up a time signal? A tasting sample of this kind would select and educate, just as the original five-shilling Brownie camera selected and educated the successful amateur photographer.

[The foregoing article represents the views of a visitor who has had a long experience of the systematic investigation of business problems; he has brought his critical faculties to bear on the model engineering features of our exhibition, and he puts our readers on their defence. What have they to say in reply?—Ed. M.E.]

The metallurgical field is insistently demanding a refractory material which will stand up under more severe heat conditions, states the Bureau of Mines. There are many other demands on a refractory for specific utilisation, but it must be primarily a material with a high softening point. The refractory further must not vary widely in acidity or basicity from the slag with which it comes in contact. With these considerations, together with that of economy in view, it is apparent that there are only a very few materials available for the purpose. It is proposed to start work in America on the system ZrO_2—Al_2O_3—SiO_2 with the object in view of obtaining fundamental data in regard to refractories, abrasives and quartz glass. The purification of the ZrO_2 has already been completed. An induction furnace in which temperatures up to 3,000 deg. Cent. can be attained is being installed for this and similar work at the Ceramic experiment station at Columbus, Ohio.

Radio Engineering.

Some Queries Discussed.

A correspondent who states he is a novice in wireless matters raises some points of more than usual interest, so that the following remarks, which are really a reply to his queries, are given rather more space than is usually allotted to replies to queries.

A circuit (Fig. 1) is submitted for criticism and various questions are asked concerning it. The circuit is arranged for " dual " amplification, i.e., the incoming signals are amplified by the valve in conjunction with a H.F. transformer, the rectified signals from the crystal being fed back through the valve for further amplification. The writer has not used a circuit of this description so cannot speak with certainty on its merits. There would seem to be some little uncertainty, however, as to how the grid potential is controlled. As the circuit stands, current arrives at the grid *via* the crystal. Now, the average resistance of a crystal is somewhere about 3,000 ohms, whereas the resistance of a grid leak averages 3 megohms. Some consider-

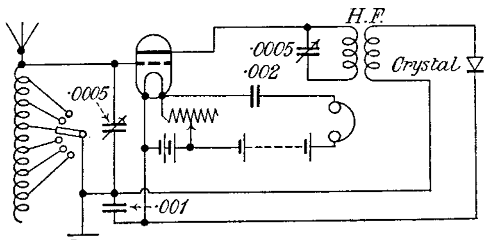


Fig. 1.—The Circuit in Question.

able difference! An amateur of the writer's acquaintance-a very capable and serious experimenter—reports that in his hands a similar circuit gave exceedingly poor results. Personally, the writer does not altogether believe it is good policy to expect a valve to perform many functions at the same time, and would much rather let a valve carry out one function only, and where H.F. amplification is concerned he is convinced that this is especially wise. Many may consider this an old-fashioned or even a retrograde idea, but on the other hand a great many very serious and experienced amateurs adopt the " one valve, one job " idea. We have all heard about " Jack-of-all-trades."

The nest two queries can be taken together as they deal with the same point, *viz.*, whether a valve circuit involving reaction will produce louder signals than that shown, or whether the range over which reception is attempted will have any effect on the loudness or otherwise of the signals. The writer would prefer a single circuit involving reaction to the one under discussion, as, properly handled, it gives very satisfactory results with a minimum of adjustments, and provided the user of such a circuit is sufficiently experienced to arrange things exactly, there should be very little possibility of causing interference. It is possible that there might be a little gain in strength of signals on long distance working when using the circuit illustrated. There is no need to provide a leak) grid condenser as the valve is not functioning as a detector, this work being performed by the crystal. The writer would prefer a carborundum steel detector for a circuit where a valve is used in conjunction with a crystal, as it will stand up to its work much better under conditions which would soon put the more delicate crystals out of action. The next four queries relate to the use of a high-frequency transformer, special

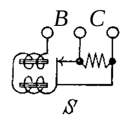


Fig. 2.-B battery terminals, C to circuit under test, and S the shunt.

reference being made to one described and illustrated in "Wireless Apparatus Making. " The tuning of such a transformer is usually fairly critical, and nearly always a small variable condenser is put across its primary to give exact adjustment. There are two types of H.F. transformer in common use. First, the spool-wound pattern usually fitted with spring legs so that it can be mounted into an ordinary valve holder. This method serves two purposes. It is extremely important that a H.F. transformer he connected correctly, and the four leg fitting ensures this. Then again, as this type of transformer has a definite range of wave-lengths according to its winding, it is usual to employ a series-as with basket or lattice coils--when the receiver is

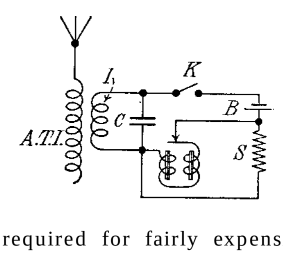


Fig. 3.-B battery, C small condenser of ·0001 capacity, I small inductance, K key, and S shunt.

required for fairly expensive work. The four-leg fitting ensures ready interchangeability. The transformer refrrred to in the queries belongs to the second type, where the primary and secondary windings are both tapped. This will be quite suitable for the range over which our querist desires to work (300—3,000), as its extreme range will be somewhere about 15,000 metres, while the first tapping will give up to about 900 metres. The secondary must be tuned in accordance with the amount of primary used, though it is quite possible to vary the ratio

between primary and secondary by means of the two switches.

The question of adding a buzzer circuit for crystal adjustment is then raised. There are two methods of doing this. One is to employ a separate oscillatory circuit energised by a buzzer and to couple its inductance to the A.T.I. of the receiver. The other method is to break the closed circuit at some convenient spot and to insert the buzzer at this point, taking connection from it across its break. The former method would be preferable in the present instance. The writer does not know what the letters "R., C. and T." signify on our correspondent's buzzer. If he will trace out the connections he will most probably find that one terminal leads direct to the electro-magnet, another to the contact point, while the third is in connection with the armature. One terminal is, therefore, common to both the battery and the circuit it is desired to buzz. A well designed buzzer should have its make and break shunted by a fairly high resistance, this tending to reduce sparking at the contacts and to promote the generation of small oscillating impulses. Fig. 2 shows the possible lay-out of the buzzer in question, while Fig. 3 shows the method of applying the buzzer to the receiver circuit.

Thanks are due to our correspondent for pointing out an error on page 90 of "Wireless Apparatus Making." Here an example is given showing how inductance is calculated. It is presumed that a capacity of .001 mfd. is to be employed, but in the actual example .01 is the value used. This is, obviously, an error but does not affect the method. Replacing the missing nought gives the total as 2,500,000 cms. It is not usual, unless very precise calculations are desired, to take the natural capacity of the amateur's aerial into consideration. This capacity must, obviously, vary very greatly in different cases, and very few amateurs would be able to ascertain the capacity of their aerials. Taking the inductance mentioned in the final query, *viz.*, 135 turns of No. 20 (covering not specified) on a 5 ins. length of 2 ins. diameter tube-in the first place the tube will not hold such a quantity in a single layer ; but supposing it did and that the covering was single silk, and allowing .0001 mfd. as the capacity of the aerial, then the wave-lengths of the inductance will be just a little over 300 metres.

* * *

Replies to Wireless Inquiries.

A. F. G. (Weymouth).—(1) Yes ; the circuits must be tuned to the same wave-length, but as you have a variable condenser in each circuit you produce this tuning by varying both inductance and capacity, and not inductance only. (2), (3) Put your aerial condenser in series with the A.T.I. and your trouble will most probably disappear. Your present switching arrangement appears to be quite in order. Increase your H.T. to 45 volts. A 'phone condenser is most essential. (4) The transformer will probably serve if you make it step-up. You will certainly require one stage of amplification before a loud-speaker.

M. F. (Aldgate).—You may try the aerial you suggest, but it is doubtful whether results will be good. It would most probably be better to sling the aerial between the chimney and the pole furthest from it, using two wires spaced at least four feet apart. This would be quite good for broadcasting, especially as you are so near 2L.O. A single headphone, by which you probably mean a single earpiece, of 150 ohm resistance, will be useless for crystal reception.

W. J. T. (Burslem).-You should be able to work over a range of several hundreds of feet. It is impossible to give anything but a very approximate figure, as so many factors enter the case. You must be very careful not to connect any part of the transmitting gear to an aerial or earth, but to use antennæ in the form of metal rods or plates carefully insulated from the table or bench.

W. C. D. (Irlam).—(1) 3,000 metres. (2) Variable of .0002 mfd. maximum capacity. (3) About 900 metres. (4) You do not state the dielectric of your condenser, but presuming it to be air, then the maximum capacity will be about .00085 mfd. (5) You do not state the thickness of the glass plates (an important factor). Taking this as .2 cm. then the maximum capacity will be about .0045 mfd.

F. M. (Bristoi).-The circuit you show would not be approved, as it involves reaction coupled to the A.T.I. Make up a circuit on the lines of Fig. 1. A.T.I. 250 turns of No. 24 S.S.C. on 3 ins. diameter tube tapped at every 10 turns. Use H.R. 'phones (4,000 ohms total) and any of the usual types of valves. The transformer is the usual iron core L.F. type. Condenser values are marked. Use the type of aerial shown in your Fig. 11, only if possible suspend the upper end from the chimney instead of the eaves, as shown. The frame aerial you suggest would be very poor.

J. F. G. B., Lt.I.A. (Jullundur, India), sends complete detailed diagrams of his proposed station and desires information and suggestions.

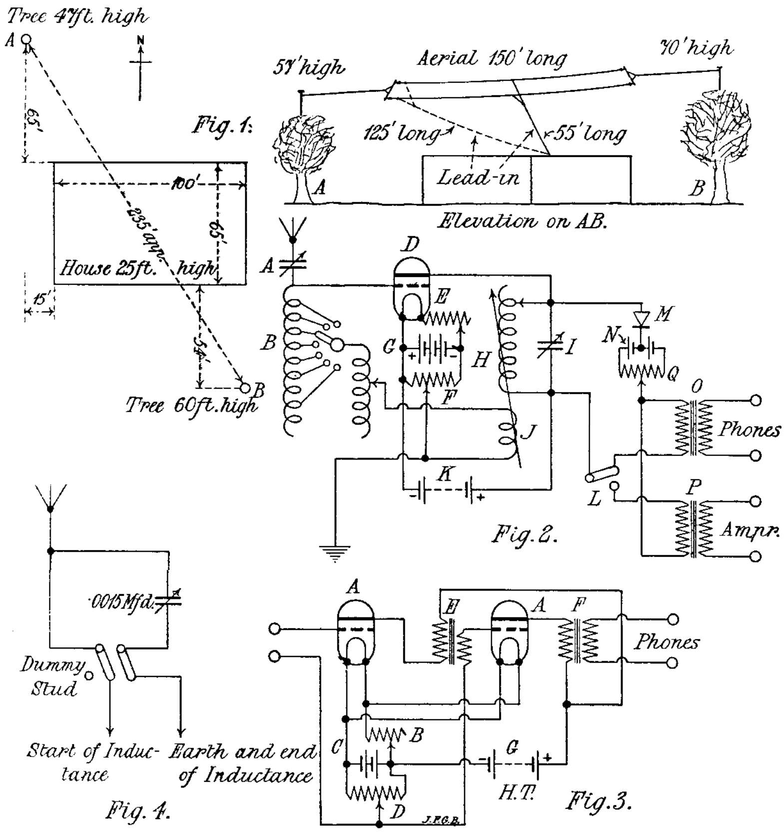
Fig. 1 shows his proposed aerial, the dotted line indicating an alternative lead-in. All details given concerning the aerial are quite correct and it should make up very well. The difficulty lies in the choice of lead-in. Making the aerial an inverted "L" causes the lead-in to make a very acute angle with the aerial and this should be avoided as far as possible. The remedy, then, is to make the aerial a "T." The great trouble with such an aerial is the

difficulty of finding the exact point for the attachment of the lead-in. If the aerial were truly horizontal, then the central point would be correct and the lead-in should be vertical. When the aerial is at an angle with the ground and the lead-in comes away at an angle, then unless matters are correctly adjusted the two portions of the aerial on either side of the lead-in have slightly different natural wave-lengths, and this may lead to trouble in tuning. However, if our correspondent will take his lead-in from a point a foot or so past the centre and

to be large enough. It is strongly recommended that a set of honeycomb coils be obtained together with a standard plug-in holder to take three coils. This will do away with the necessity of making up four separate coils (B, C, H and J). Coupling will be much more certain and easier, and at the same time self-capacity will be cut down considerably.

D.—" Xtraudion " valves will be quite suitable.

E.-Filament rheostat of 6 ohms of No. 24 Eureka will be correct.



Diagrams of J. F. G. B.'s Proposed Installation and some suggested Improvements.

toaards the higher end, no doubt correct adjustment can be made by altering slightly the length of the two suspensions

Fig. 2 is the diagram of the set which is required to receive over a range of from 600 metres to 20,000 metres. The following suggestions are made.

A.-Condenser should have a maximum capacity of .0015 mfd., this requiring 43 fixed and 42 moving plate5 of standard size The proposed capacity of .01 mfd. is too large.

B.-The proposed Inductance-6 ins. diameter, 510 turns of No. 30 E.C. wire-is hardly likely

F.-This potentiometer should have a total resistance of about 400 ohms, and wire as fine as No. 40 Eureka may be used. The use of a much heavier gauge wire allows too great a drain upon the cells.

G.-It seems that accumulators are not possible in our correspondent's case. He proposes to use Leclanché cells of the " sack " type, and of large size Carbon rods are 12 ins. long by ½ in. diameter, zincs (circular) 12 ins. by 10 ins. by 1-16th in. thick. These cells should be satisfactory provided they can maintain a discharge of at least .4 amp. for every valve

in use during the period the set will be in use. Four cells would be preferable to three.

I.-Condenser of 005 mfd. capacity is rather too large ; one of .001 mfd. maximum would be ample (29 fixed, 28 moving plates).

K.-H.T. battery of 60 volts, preferably with tappings would be suitable.

L.--The use of this switch for optional amplifier is quite in order.

M.-Carborundum-steel detector is the best for such a circuit.

N.--Four drr cells will be sufficient. The use of a switch in-series with the battery is recommended, otherwise the cells will be exhausted during " off " periods.

O.-Step-down transformer (5,000 ohms to 120 ohms) is correct provided the 'phones are low-resistance of 120 ohms.

P.-L.F. transformer (step-up) 5,000 ohms to 15,000 ohms is recommended.

Q.-Detector potentiometer may be of exactly simiiar design as grid potentiometer.

Fig. 3 is a diagram of the low-frequency two-valve amplifier, and the following remarks apply :—

A.--" Xtraudion " valves will be quite suitable.

B.-Filament rheostats as (E) above.

C.-These (preferably four) cells can be as (G) above. The remarks as to steady output apply more particularly here, as a minimum of .8 amp will be necessary.

D.-Grid potentiometer should be as described above (F).

E.-Transformer (L.F.) should be step-up about 4,000 ohms to 20,000 ohms.

F.--Step-down transformer 5,000 ohms to 120 ohms will be correct.

G.-H.T. battery of 60 volts with tappings.

Additional remarks.-It is recommended that the transformers be purchased. Many quite reliable patterns are now on the market, their cost varying from 15s. to 25s. for L.F. intervalve, while the step-down 'phone transformers are a little cheaper.

The set will function equally well on spark and C.W. There is little to be gained by screening the amplifier. A useful addition to the receiver would be the inclusion of a series-parallel switch for the aerial tuning condenser, as shown in Fig. 4. This will enable variations in the wave-lengths to be made when using any particular coil as A.T.I.

R. J. N. (Blackheath).—(1) The power developed will be very small, and the engine cannot be recommended for any real work. It is purely a demonstration model to show the principle of working of that early type of engine. (2) See above. (3) Either wood or sheet metal. (4) Yes. (5) Nearly vertical if you can so arrange it. (6) Yes.

Practical Letters from our Readers.

"Atlas-Yankee" Lathes.

To THE EDITOR OF The *Model Engineer*

DEAR SIR,—In reading over the article in a recent issue of the *M.E.*, featuring the " Atlas Yankee " lathe 3 ins., and also " Atlas " lathe 4 ins., we are much interested in the remarks made by your expert, Mr. Gentry, and also in the suggestions which he puts forward. With particular reference to the suggestion respecting raising centre of the "Atlas-Yankee" lathe from 3 ins. to $3\frac{1}{2}$ ins., we may say that we are now prepared to supply the " Atlas-Yankee " lathe on 30-in. gap-bed in either g-in. or $3\frac{1}{2}$-in. centres as desired and at no extra charge.

With respect to price, you made a slight error with regard to the Pillar type machine, and we give you herewith the price at which we offer this particular lathe, namely, bench type 3 ins. or $3\frac{1}{2}$ ins. centres £25 ; if mounted on standards with chip tray and treadle motion £28 10s.

We are also making the hollow spindle now with 9-16th in. hole through, so that it will take $\frac{1}{2}$ in. diameter stock, and are fitting the tailstock with set-over base, so that the lathe is now, we suggest, quite complete and a really high-class production which should meet the requirements of all sorts and conditions of mode' makers.-Yours faithfully,

For Arthur Firth, Limited,

JOHN S. BLACKBURN,

Managing Director.

Power-Driven Model Aeroplanes.

To THE EDITOR OF *The Model Engineer.*

DEAR SIR,—*Re* the subject of model aeroplanes, may I, as an experimenter in this direction, be permitted to say a few words on the subject.

Firstly, let me say that I think Mr. Barraclough is to be congratulated on his attempt at a petrol-driven 'plane. Though not a complete success, it would certainly be not unprofitable to have full particulars of his machine published. The difficulty he mentions regarding the weight of the ignition system is, I think, the great stumbling-block in the progress of model aviation. Remove this drawback, and efficient 'planes of handy size and of good duration in flight would then be practicable. Model 'planes would then slowly but surely take their rightful place alongside model boats and locos. Until that day the various aero enthusiasts scattered all over the country badly need the special support of the M.E.

Secondly, with regard to " Progression's " letter, let me suggest that increased duration is not the only advantage of petrol. The latter has or will have several advantages over corn

pressed air, including the important point of better weight distribution.

With regard to wireless control, I fail to see how it can be practicable for 'planes under 10 ft. span, and few could afford the money for work of this size and complexity.

Lastly, might I remark that no model engineer should scorn to work in such apparently simple materials as wood, wire. silk, etc. There is work for all, from the man of few tools and no proper workshop, to the more fortunate possessor of a miniature machine shop. Let the former construct simple rubber-driven models—the much despised stick model is a valuable instructor. He can then do much experimental work, such as wing sections materials and the best way of employing them, etc. The latter can go in for more advanced construction, and make a bid at solving the power problem.

British engineering productions have won an enviable reputation on land and sea, and it is only fitting-that such should be the case regarding our aircraft. Who can say that models will not play an active part-it is not too much to say that they may be instrumental in saving much money and possibly valuable lives.—Yours faithfully, "PROP."

To THE EDITOR OF ***The Model Engineer***

DEAR SIR,—I have read with great interest the correspondence about model aeroplanes which has taken place in the *M.E.* during the past few weeks. I heartily agree with "Progression" that a good deal more attention should be paid to the control of model aeroplanes and with Mr. Rippon that the petrol-engine for model-aeroplane work should be developed, but at the present moment aeromodelists only seem to be able to produce pretty little elastic-driven models.

There seems to be only one model engineer who builds compressed-air plants with any success, his engines having proved themselves to be extremely efficient. In the only contest for power-driven models held last year there were only five entries and all these entries used compressed-air engines made by the modelist just mentioned. The people who entered for this competition were, as far as I know, about the only members of the "Society of Model Aeronautical Engineer: " who have built power-driven model aeroplanes since the war, and even they did not build the plants themselves.

All this shows a ***gross*** lack of enterprise, and the conclusion which I draw is that aeromodelists should take up compressed-air now and then ; after they have obtained fair success with that, I think they will develop more complicated plants, as steam and petrol-engines, for model aeroplane purposes. They cannot jump from elastic to petrol • it is compressed-air that should be popularised in 1923 and petrol will come later.—Yours faithfully,

W. D. COOKE.

Wanted : Planished Steel Plate.

To THE EDITOR OF ***The Model Engineer.***

DEAR SIR,—Having been a constant-reader of the *M.E.* for a number of years, I am writing to you for a little help with rkgard to some material I require for the construction of a scale model locomotive. The material in question is some 14 B.W.G. planished steel plate for the frames, and some 18 B.W.G. tinned iron for cab, splashers, etc. I have tried every metal warehouse that I know in London but always receive the same answer, that they can only supply me with either of these if I am prepared to buy a 6 ft. by 2 ft. 6 ins. sheet. The actual quantity I require is about a third of a sheet in each case, this being ample, and I wonder if you or any of my fellow readers could put me on to a firm that will supply these materials in small quantities.-Yours truly,

E. HECKMAN.

Value of Old Grandfather Calendar Clock.

To THE EDITOR OF ***The Model*** Engineer.

DEAR SIR,—As a regular reader of the *M.E* for some years past, I thought you might be able through its columns to give me some information regarding an old-fashioned Grand. father clock which I have. It has a brass dial 12 ins. square, with arch top and embossed work at corners, and contains within the hour ring circular calendar of 31 days, with small moving hand, also minute hand above. A small aperture cut 'through the dial above the hour ring is marked on each side with Strike Silent. then in the arch on top there is a small circle 'with a kind of hand, and which is marked (morning hymn) (100 Psalm) (evening hymn) and (104 **Psalm). On the hour ring at bottom** is the maker's name. "Robert Samson, Petty France, London." The motions are generally in good condition with the exception of a few parts missing belonging to the calendar and musical part.which contains a kind of polyphone or' cylinder fitted with small pins which when revolved lift S small hammers, striking on 8 bells. I have been told by several clockmakers that it is very valuable. I shall be ***very*** grateful if you can in any way enlighten me on this point.-Yours truly,

C. W. ROGERS.

Gas Blowpipes.

To THE EDITOR OF **The *Model Engineer***

DEAR SIR,-If you get a piece of $\frac{3}{8}$-in. brass pipe about 4 ins. long into the tee where it is marked A you will get a much better flame. If you live anywhere near here I shall be pleased to show you a blowpipe the same size working. Yours faithfully,

W. W. EVERS.

Society and Club Doings.

Secretaries are notified that all notices of forthcoming meetings must reach us **10 days** *previous to date of publication of any given issue.*

Model Engineering.

The Society of Model & Elementary Engineers.

ORDINARY MEETINGS will be held at Caxton Hall, commencing at 7 o'clock, on Wednesday, April 11, Wednesday, May 2, and Thursday, May 31.

COMPETITIONS.—At each ordinary meeting there are competitions for the Challenge Shield and the Bronze Plaque and Medal. The particulars and conditions are on the notice board at the meetings or may be obtained from the Secretary on application. Members are requested to bring up work for these competitions or for exhibition.

TREASURER.—There are still a few members who have not been able to find him. Please see him at the meetings or address him, Mr. A. J. R. Lamb, Room 173, Windsor House, Victoria Street, Westminster, S.W.1.

WORKSHOP.—Demonstrations. On Mondays, March 19, "Turning," by Mr. H. G. Eckert; March 26, "Marking Out," by Mr. R. A. Allman; April 16, "Brazing, Silver and Soft Soldering," by Mr. H. G. Eckert; April 30, "Shaping," by Mr. C. S. Barrett, May 14, "Drilling and Drill Grinding," by Mr. H. G. Eckert; May 28, "Finishing Work," by Messrs. Hildersley and Frank+ These demonstrations form a continuation of the series on "The Elementary Use of Tools." On Mondays, April 9 and May 7 rummage sales will be held.

NOTICE.—The Workshop will be closed for Easter on Saturday March 31, and Tuesday, April 3.

Full particulars of the Society with forms of application for membership and visitors' tickets for meeting at Caxton Hall or for the Workshop when open for work, may be obtained from the Secretary Mr. F. H. J. BUNT, 31, Mayfield Road, Gravesend, Kent.

The Society of Model Aeronautical Engineers.

(London Aero-Models Association.)

The Annual General Meeting will be held at headquarters on Friday, March 16, at 7.30 p.m.

On Friday, March 23, at headquarters Mr. A. F. Houlberg will lecture on "Power Plants for Model Aeroplanes."

The programme for 1923 has been submitted by the Sub-Committee and passed by the General Purposes Committee. It is now in the printers' hands.

A challenge cup has been presented to the Society by Mrs. S. Jones, and it was unanimously agreed that it should be known as the S.M.A.E. Cup. A hearty vote of thanks was passed to the donor for making such a magnanimous gift.

The editor of the *M.E.* has presented a cup in appreciation of the collective display of models loaned by the members of the S.M.A.E. at the last MODEL ENGINEER Exhibition. This is greatly appreciated by the members, and a hearty vote of thanks was passed to Mr. Percival Marshall.

The Bristol Society of Experimental Engineers and Craftsmen.

NEXT MEETING.—March 20. "Chains and Chain Making," by H. G. Priest. Dealing chiefly with present day methods, and some remarks on making scale-size chain. April 3, exhibition of models among members. Bring as many friends as possible and get them to help carry the models. We want a ***good*** show this time.

RECENT EVENTS.—Mr. A. E. Johns in February gave us an outline lecture on waterworks engineering, dealing with ancient and modern methods of distribution. On February 20 the Society enjoyed an evening with Mr. Bassett-Lowke's lecture and slides on model making. During the past week two evenings have been given to a demonstration at Mr. Palmer's workshop, Montpelier, on "Cycle Brazing and Tube Bending." Quite a number of tips were picked up, and it was unfortunate that inclement weather prevented a larger attendance.

H. G. PRIEST, Hon. Secretary, 278, Bath Road, Bristol.

The Devonport & District Society of Model and Experimental Engineers.

The first general meeting of the above Society was held at the Stoke Public Hall, Tavistock Road, Devonport, on Thursday, March 1. A small comtnittee was elected *pro tem.*, viz., Chairman, Mr. H. R. Langman; Secretary, Mr. L. Warburton, 31, St. Aubyn Avenue, Keyham; Treasurer, Mr. C. Barrett.

After the discussion of rules and other business, Mr. A. Watts gave an interesting lecture describing the "Construction of Model Steam Engines from Scrap Material."

The excellent specimen of beam engine exhibited clearly showed his great skill, patience, and industry as a modeller. The Society hopes that all modellers in Plymouth will join it, and so extend the art of tnodel making in all its phases.

Full particulars of the Society and forms of application for membership may be obtained from the Secretary, L. WARBURTON, 31, St. Aubyn Avenue, Keyham, Devonport.

Marine.

The Victoria Model Steamboat Club.

(Bathing Lake, Victoria Park, E.9.)

An extraordinary general meeting was held at the boathouse on March 4, when a presentation was made on behalf of the members of a gold-

mounted smoking outfit to flag officer W. Poole, in recognition of his valued services in the past as Hon. Secretary.

In expressing his thanks Mr. Poole said he was sure that the club would be kept to a high standard of efficiency by its present officers.

Owing to the lake undergoing repairs, our fixtures have been postponed ; in the meantime we are open to accept invitations from other clubs to run on their waters.

Particulars of membership to the Victoria Model Steamboat Club may be had from JOHN G. PHILPOT, Hon. Secretary, 115, Richmond Road, Barnsbury, N.1.

Model Yacht Regatta at Ardnamurchan, Argyllshire, West Highlands.

The above regatta, which had been held in abeyance for a long time took place on February 17, on Loch Mudale, a fine sheet of water about a mile in length, and three-quarters broad. A large number of enthusiasts from a wide area witnessed the proceedings.

A stiff southerly breeze prevailed all day, which made sailing conditions ideal for both spectators and competitors.

Fourteen yachts entered for the race, which decided the championship for the year.

Throughout the day the sailing qualities of the different models were freely discussed, and there seems to be every prospect of keen competition in future, as half-a-dozen prospective defenders, at least, are being designed, or are in course of construction.

Altogether a most enjoyable day was brought to a close by the distribution of valuable prizes to the successful yachtsmen, who are as follows, *viz.* (1) D. Cameron, Swordale ; (2) A. Cameron, Upper Ockle ; (3) J. McPherson, Achateny ; (4) D. Cameron, Ormsaigbeg.

Consolation prizes were awarded in a number of cases.

[The type of boat used by this club is 36 ins. overall length, 9 ins. beam, and presumably unlimited sail and draught.—ED. M.E.]

Wireless.

St. Bride Radio & Experimental Society.

A very interesting and instructive evening was spent by members of the above Society on Wednesday, February 21, when the President, Capt. H. Riall Sankey, C.B., C.B.E., R.E. (Retired), M.Inst.C.E., occupied the chair. The proceedings opened with an admirable lecture by the President, in which he explained in non-technical language the rudiments of wireless telephony. The lecture was copiously illustrated by lantern slides and blackboard diagrams..

This was followed by a short demonstration and general meeting when the Formation Committee gave an account of their stewardship ; draft rules of the Society were submitted to the meeting and approved ; permanent Committee and officials elected and meeting nights arranged for alternate Mondays at 7.30 p.m., commencing March 5.

Visitors and prospective members are cordially invited to any of the meetings of the Society.

R. J. BERWICK, Institute Manager, Bride Lane, Fleet Street, E.C.4.

We hear that the Commonwealth Edison Co., of Chicago, in order to gain experience of the latest developments in steam turbine practice in this country, have placed an order with C. A. Parsons & Co., Ltd., of Newcastle-on-Tyne, for a 40,000-kw. turbo-alternator. It is reported that the 25,000-kw. turbo-alternator which the Commonwealth Edison Co. bought from the same makers in 1912 for their Fish Street station continues to run satisfactorily. The set which has just been ordered is to be installed in the new Crawford Avenue power station, Chicago, of which the designed capacity will be about 500,000-kw., the rest of the plant being probably mainly of American manufacture. The new set, which has a continuous rating of 40,000-kw., is a 60-cycle machine, will be supplied with steam at 550 lb. per square inch, and will run at 1,800 r p.m.

Notices.

The Editor invites correspondence and original contributions on all small power engineering, motor and electrical subjects. Matter intended for publication should be clearly written on one side of the paper only, and should invariably bear the sender's name and address. It should be distinctly stated, when sending contributions, whether remuneration is expected, or not, and all MSS. should be accompanied by a stamped envelope addressed for return in the event of rejection. Readers desiring to see the Editor personally can only do so by making an appointment in advance.

All subscriptions and correspondence relating to sales of the paper and books to be addressed to Percival Marshall & Co., 66, Farringdon Street, London, E.C.4. Annual Subscription, £1 1s. 8d., post free to all parts of the world.

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Contents.

The asterisk (*) denotes that the subject is **illustrated.**